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North Carolina Department of Transportation
Planning and Research Branch
Statewide Planning Group
Systems Planning Unit

Orange County

Thoroughfare Plan

Study Report

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THOROUGHFARE PLAN

FOR

ORANGE COUNTY, NORTH CAROLINA

Prepared by the:

Statewide Planning Unit
Planning & Research Branch
Division of Highways
N. C. Department of Transportation

In Cooperation With:

Orange County
The Federal Highway Administration
U. S. Department of Transportation

October, 1990

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October, 1990

Dear Residents of Orange County:

I would like to take this opportunity to comment on the Orange County Thoroughfare Plan. To accommodate Orange County's request, the Orange County Thoroughfare Plan is based on the Orange County Road Classification system.

The County Road Classification plan uses similar terminology for road classifications as that used in the State system, however, the terms represent different classes of roads. In order to clarify these discrepancies, the Orange County Thoroughfare Plan includes on its legend the County classification and its corresponding State equivalent classification. The equivalents hold true for all but two instances. US 70 and NC 86 are Primary Arterials on the County Classification system which corresponds to a Minor Arterial on the State system, but in these cases the two are major collectors. This is due to the fact that the State Minor and Principle Arterials are classified on a statewide basis and federal guidelines allow for a maximum percentage of arterial road mileage compared to total road mileage for the state. North Carolina is currently exceeding this percentage, therefore under current guidelines it is not feasible to reclassify these roads.

Sincerely,

Danny Rogers

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I. INTRODUCTION

The overall growth (economical, social, agricultural, etc.) of a region can be greatly influenced by how efficiently the transportation system handles travel demands. If the system fails to provide the means for quick and convenient transportation of people and goods, the region's overall growth becomes stagnated and fails to reach its full potential. It is necessary that such a system not only meet existing travel demands, but that it also keep pace with the development of the region. This report will set forth a system of thoroughfares to serve the anticipated traffic and land development needs of Orange County for the next twenty years. In the development of the system of thoroughfares, certain priorities shall be established based on maintenance needs, inadequate bridges, poor horizontal and vertical alignment, and insufficient present and future capacity.

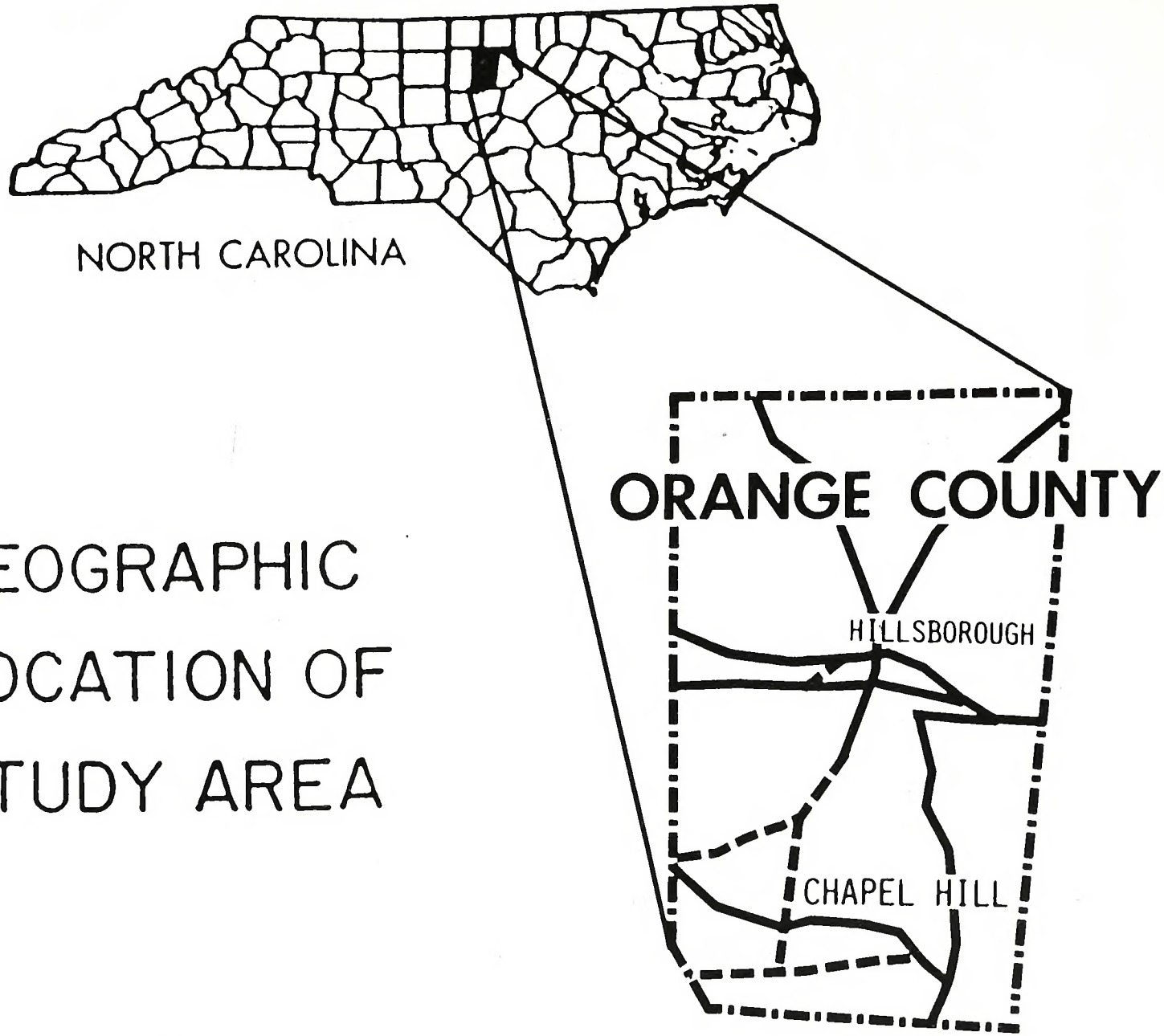
The system of thoroughfares proposed was developed following the basic principles of thoroughfare planning as described in Chapter II of this report. Major thoroughfares were located based upon existing and anticipated travel demands, existing streets, existing and anticipated land developments, topographic conditions, and field investigations. The plan advocates these improvements which are felt to be essential for proper traffic circulation within the current planning period (1990-2010).

This study of the existing and proposed thoroughfares in Orange County is based on what is called a "sketch" planning process. Due to the lack of resources which are used to prepare a computer-based travel forecasting model (and the lengthy delay associated with this preparation), this study is not predicated upon specific forecasts of traffic keyed to specific forecasts of housing and employment growth. The "sketch" planning process emphasizes using common sense, extensive field investigation, and public review to establish recommendations.

In North Carolina, road building authority lies with the State and municipalities rather than with the counties. For this reason, urban thoroughfare plans developed for municipalities have been used for long-range thoroughfare planning. However, county plans have generally been used for functionally classifying the relative roles of existing facilities. This county plan does not deviate from this "rule". The functional role of each existing and proposed rural thoroughfare is described in this plan.

Responsibility for any proposed construction of new roads or improvement of existing roads must be shared by the county and the Division of Highways. With the different governmental agencies involved in providing the elements of the plan, coordination of activities is of prime importance. Therefore, a formal adoption of the revised plan resulting from this study is needed by the county and the North Carolina Board of Transportation.

An effective implementation of a plan requires the county and State to procure in advance or protect by various legal controls the rights-of-way necessary for improvements which will ultimately be required. The thoroughfare plan is based on anticipated growth in the rural area. Because actual growth rates and patterns may differ from those logically anticipated, it may be desirable to accelerate or retard the development of thoroughfares or to make revisions that will coordinate with these actual rates and patterns. For this reason, periodic updates of these studies should take place every five to ten years unless conditions warrant otherwise. It is imperative to the development of a county that the thoroughfare plan be closely coordinated with other phases of a comprehensive plan for this county.



GEOGRAPHIC LOCATION OF STUDY AREA

FIGURE 1

II. COUNTY THOROUGHFARE PLANNING PRINCIPLES

Purpose of Planning

There are many benefits to be gained from thoroughfare planning, but the main objective is to assure that the road system will be progressively developed in a manner that will adequately serve future travel desires. Thus, the cardinal concept of thoroughfare planning is to make provisions for street and highway improvements so that when needs arise, feasible opportunities to make improvements exist.

Streets, roads, and highways, carry out two primary functions. They provide traffic service and land service. When combined, these two uses are basically incompatible. This conflict is not serious if both traffic and land service demands are low. When traffic volumes are high, however, access conflicts created by uncontrolled and intensively used abutting property result in intolerable traffic flow friction and congestion.

The major benefits derived from thoroughfare planning are: (1) Each road or highway can be designed to perform a specific function and to provide a specific level of service. This permits savings in rights-of-way, construction, and maintenance costs; protects residential neighborhoods, and encourages stability in travel and land use patterns. (2) Local officials are informed of future improvements. Developers can design subdivisions to function in a non-conflicting manner. School and park officials can better locate their facilities. Damage to property values and community appearance that is sometimes associated with road improvements can be minimized.

County Thoroughfare Planning Concept

The underlying concept of the thoroughfare plan is that it provides a functional system of streets, roads and highways which permit travel from origins to destinations with directness, ease and safety. Different elements in the system are designed and called on to perform specific functions and levels of service, thus minimizing the traffic and land service conflict.

Within the county plan, elements are considered to be either urban or rural. In the urban planning area, the local municipality generally has planning jurisdiction. Outside the urban planning area, the county has planning jurisdiction . In those urban areas where no urban thoroughfare plan has been developed, elements are generally considered to be rural and under the planning jurisdiction of the county. When a thoroughfare plan is developed for an urban area that has not previously had a plan, then the area defined by that plan would be considered urban and come under the planning jurisdiction of the municipality.

Within the urban and rural systems, thoroughfare plan

elements are classified according to the specific function which they are to perform. A discussion of the elements and functions of the two systems follows.

Urban Thoroughfare Classification System

In the urban thoroughfare plan, elements are classified as either local access streets, minor thoroughfares or major thoroughfares. Local access streets which may be further classified as residential, commercial, or industrial streets are designed only to provide access to abutting property. Minor thoroughfares are more important streets in the urban system and are designed to collect traffic from local access streets and carry it to the major thoroughfare system. They may also serve abutting property and serve some minor through traffic movements. The major thoroughfares are the primary traffic arteries of the urban area providing for traffic movements within, around, and through the area.

Due to the limited amount of detail that can be shown on a county thoroughfare plan, generally only urban major thoroughfares are shown. A coordinated system of major thoroughfares which is most adaptable to desire lines of travel within an urban area and reflected in most urban area thoroughfare plans is the radial-loop system. The radial-loop system includes radials, crosstowns, loops, and bypasses. Radial thorough-fares provide for travel from points outside to major destinations inside the urban area. Crosstowns thoroughfares provide for traffic movements across the central area and around the central business area (CBD). Loop thoroughfares provide for lateral travel movements between suburban areas. Bypasses are designed to carry non local traffic around or through the area. Occasionally a bypass with low through traffic volumes can be designed to function as a portion of an urban loop. The radial-loop major thoroughfare system concept and concept of functionally classified urban street system are illustrated in Figure 2.

Rural Thoroughfare Classification System

The rural system consists of those facilities outside the urban thoroughfare planning area boundaries. They are classified into four major systems: principal arterials, minor arterials, major and minor collector roads, and local roads. Table 1 indicates generally accepted statewide mileage on these systems.

FIGURE 2

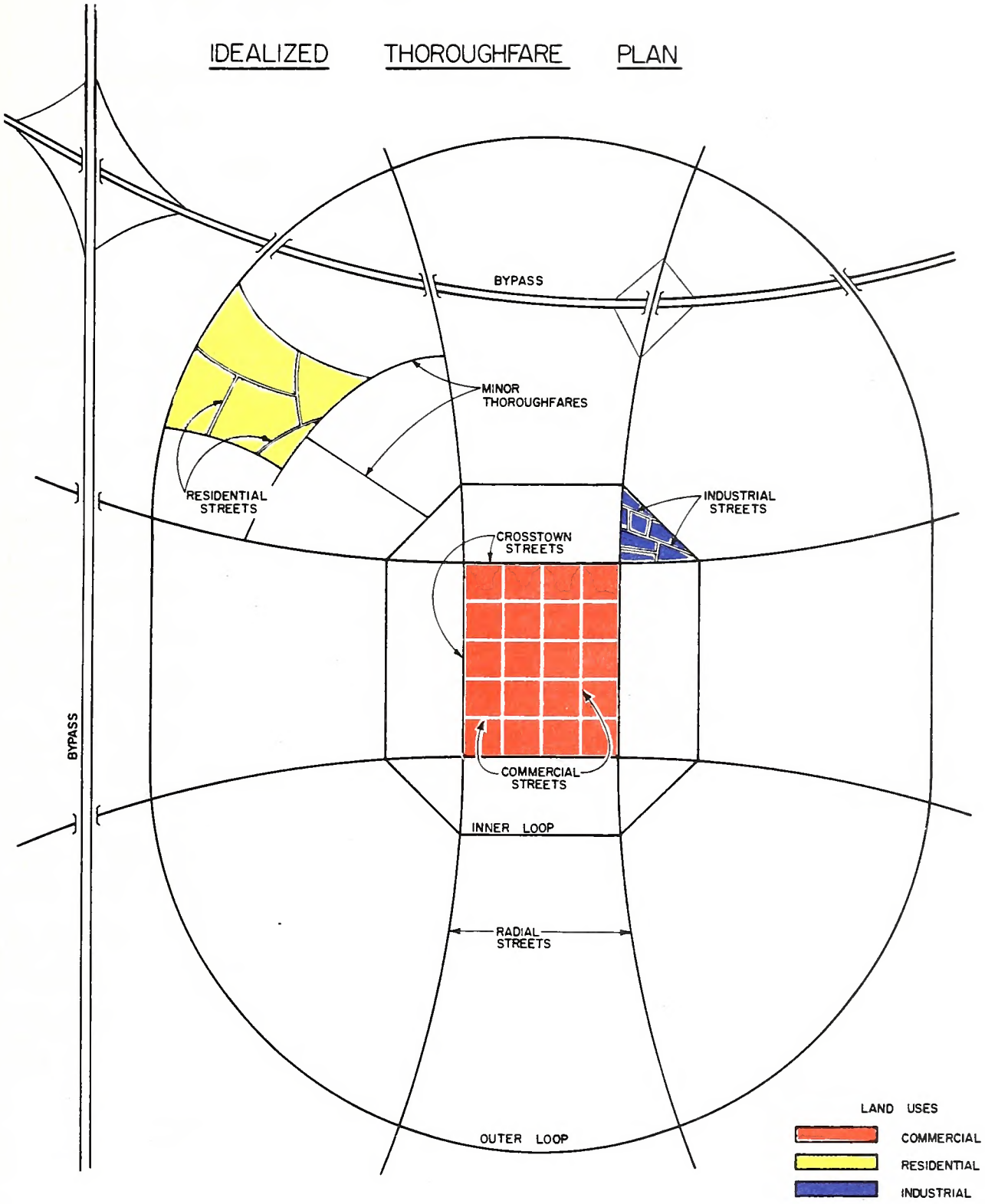

IDEALIZED THOROUGHFARE PLAN
BYPASS
MINOR THOROUGHFARES
RESIDENTIAL STREETS
INDUSTRIAL STREETS
CROSSTOWN STREETS
COMMERCIAL STREETS
INNER LOOP
RADIAL STREETS
OUTER LOOP
BYPASS
LAND USES
COMMERCIAL
RESIDENTIAL
INDUSTRIAL

Table 1

Rural System Road Mileage Distribution

Systems	Percentage of Total Rural Miles
Principal arterial system	2-4
Principal arterial system plus minor arterial road system	6-12
Collector (Major plus minor) road system	20-25
Local road system	65-75

Figure 3 gives a schematic illustration of a functionally classified rural highway system.

Rural Principal Arterial System : The rural principal arterial system consists of a connected network of continuous routes which serve corridor movements having trip lengths and travel density characteristics indicative of substantial statewide or interstate travel. The principal arterial system should serve all urban areas of over 50,000 population and a large majority of those with a population greater than 5000. The Interstate system constitutes a significant portion of the principal arterial system.

Rural Minor Arterial System : The minor arterial system in conjunction with the principal arterial system forms a network which links cities, larger towns, and other major traffic generators such as large resorts. The minor arterial system generally serves interstate and inter-county travel and serves travel corridors with trip lengths and travel densities somewhat less than the principal arterial system.

Rural Collector Road System : The rural collector routes generally serve intra-county travel rather than statewide travel and constitute those routes on which the predominant travel distances are shorter than on the arterial routes. This system is subclassified into major collector roads and minor collector roads.

Major Collector Roads: These routes (1) provide service to the larger towns not directly served by the higher systems and to other traffic generators of equivalent intra-county importance, such as consolidated schools, shipping points, county parks, important mining and agricultural areas, etc., (2) link these places with nearby larger towns or cities, or

with routes of higher classification; and (3) serve the more important intra-county travel corridors.

Minor Collector Roads : These routes (1) collect traffic from local roads and bring all developed areas within a reasonable distance of a collector road; (2) provide service to the remaining smaller communities; and (3) link the locally important traffic generators with their rural hinterland.

Rural local Road System : The local roads comprise all roads not on one of the higher systems. Local residential subdivision streets and residential collector streets are elements of the local road system. Local residential streets are either cul-de-sacs, loop streets less than 2,500 feet in length, or streets less than one mile in length that do not connect thoroughfares or serve major traffic generators and do not collect traffic from more than one hundred dwelling units. Residential collector streets are streets which serve as the connecting street system between local residential streets and the thoroughfare system.

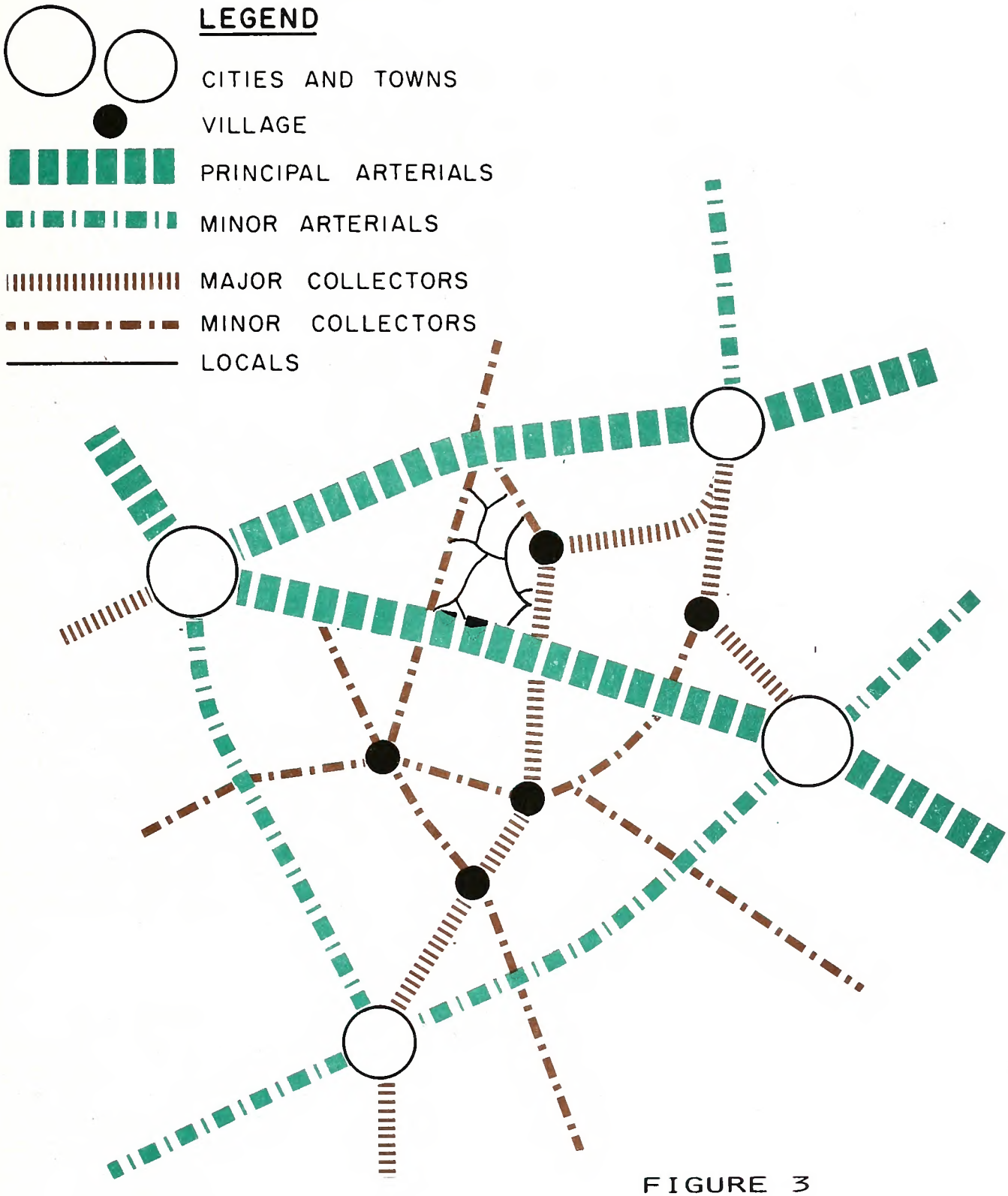


FIGURE 3

SCHEMATIC ILLUSTRATION
OF FUNCTIONALLY CLASSIFIED
RURAL HIGHWAY NETWORK

III. ORANGE COUNTY--POPULATION, LAND USE, AND TRAFFIC

Orange County is located in the northern central section of North Carolina. It is bordered by Caswell and Person Counties to the north, Alamance County to the west, Durham County to the east, and Chatham County to the south, as shown in Figure 1. The major highways in this county are I-85, I-40, US 15-501, NC 54, NC 49, NC 86, and NC 57. The Southern Railway Company possesses the only railway system in Orange County, and the system runs from the eastern city limits of Mebane, east into Hillsborough, to continue south into the Chapel Hill/Carrboro urban area. The only airport in Orange County is Horace Williams Airport, located in Chapel Hill.

The major water resources of Orange County are as follows: Eno River, located in northern Orange County; the North and South Forks of the Little River in NE Orange County; Haw River, which borders the county to the southwest; Lake Orange in the northern central area of Orange County; University Lake, located southeast of Carrboro; and a number of creeks located throughout the county. Three sections of Duke Forest exist north of the Chapel Hill/Carrboro urban area, and two more sections exist south and west of Hillsborough.

Factors Affecting Transportation

The major objective of a thoroughfare plan is to provide a system of roads to serve the existing and anticipated traffic development needs for a given area. In order to determine the future needs of an area, the existing population, land use, and traffic characteristics should be known. Specific factors used to forecast future travel characteristics are as follows: historic and potential population changes; significant trends in economy; character and intensity of land development; subdivision regulations and/or zoning ordinances; public utility availability; transportation facilities; and topographic and/or other physical features of the urban area(s).

Population Trends

One of the determining factors for the traffic characteristics of a given area is the population and/or the population trends. The population estimates the number of people who are traveling the roads. Changes in the population, along with other factors, will determine the future trends of traffic characteristics of a specific area.

In recent years, North Carolina and other southern region states have experienced a pattern of immigration. For this reason, Orange County has increased in population. Between 1960 and 1980 the county's population almost doubled, as shown in Table 2.

During the 1960-1970 and 1970-1980 periods, the annual growth rates were both 3.4%, which was larger than overall growth rate for North Carolina. This reflects the attractiveness of Orange County and the surrounding region, which includes the major cities of Durham and Raleigh, and the growing area of Research Triangle Park.

Within the county, the largest population increase has been in the township of Chapel Hill during recent decades, as shown in Table 2. However, the largest annual growth rate occurred in the Eno township during the 1970-1980 period. Arterial and collector roads will form between the areas where a large population increase has occurred.

Land Use

How land is used in a given area will determine the amount and type of traffic generated to this area. Watersheds are one of the topographical factors that constitutes a major part of Orange County. Even though these watersheds exist as sub-basins, recognizing the impact of the roads on these watersheds is imperative. The amount and type of runoff from the roads are the major factors involved in this impact. The chemicals existing in the runoff will affect the watersheds, according to the amount of chemicals that are filtered through the ground before reaching the sub-basins. Therefore, reducing the amount of runoff from these roads is one of the objectives in a thoroughfare plan.

In the urban areas, industrial/commercial areas generate a large amount of traffic from the residential areas. Therefore, a thoroughfare plan should provide safe and adequate roads to allow traffic to move freely and safely. The same applies to historic, cultural, and recreational areas.

Traffic

The number of registered cars is one factor considered in determining the major effects on average daily traffic volumes (ADT) and movements. As shown in Table 3 and Figure 4, a significant increase occurred in the number of registered vehicles in Orange County. The graph in Figure 4 was derived from dividing the total population by the total number of vehicles registered for the years shown. This graph shows the transition from a non-automobile oriented society to one that is heavily dependent on the automobile. This change occurred from the 1940's to present day; however, the greatest change occurred during the period between 1940 and 1950. This change occurred because of the following:

Table 2

Comparative Population Growth Trends

Geographic Area	Population Totals(1) 1960	1970	1980	Population Change 1960-1970 Increase	1960-1970 Average Annual Growth Rate	1970-1980 Increase	1970-1980 Average Annual Growth Rate
North Carolina	Over 4 million	Over 5 million	Under 6 million	528,256	1.16	790,018	1.55
Orange County	42,970	57,567	77,055	14,597	3.4	19,488	3.4
Bingham	1,914	2,379	3,954	465	2.4	1,575	6.6
Cedar Grove	3,183	3,146	3,166	-37	-0.1	20	0.06
Chapel Hill	25,030	38,856	50,572	13,826	5.5	11,716	3.0
Cheeks	3,643	3,571	4,821	-75	-2.1	1,250	3.5
Eno	2,025	2,550	4,450	525	2.6	1,900	7.5
Hillsborough	6,072	5,855	8,599	-217	-0.4	2,744	4.7
Little River	1,092	1,210	1,493	114	1.0	283	2.3

(1) Source: U.S. Department of Commerce, Bureau of the Census. 1980.

Table 3

Orange County Vehicle Registration			
Year	Vehicles Registered	Population	Persons Per Vehicle
1940	4,500	23,072	5.13
1950	8,668	34,435	3.97
1960	12,933	42,970	3.32
1970	25,188	57,707	2.29
1980	45,046	77,055	1.71
1990	65,900	103,600	1.57
*2000	112,600	139,200	1.24
*2010	192,400	187,000	0.97

North Carolina Vehicle Registration			
Year	Vehicles Registered	Population	Persons Per Vehicle
1940	647,242	3,571,623	5.52
1950	1,147,233	4,061,929	3.54
1960	1,704,203	4,061,929	2.67
1970	2,742,673	5,082,059	1.85
1980	3,896,544	5,881,766	1.51
*1990	5,219,000	6,493,000	1.24
*2000	7,952,000	7,005,000	0.88

* Projected Statistics

PERSONS/VEHICLE
ORANGE COUNTY & NORTH CAROLINA

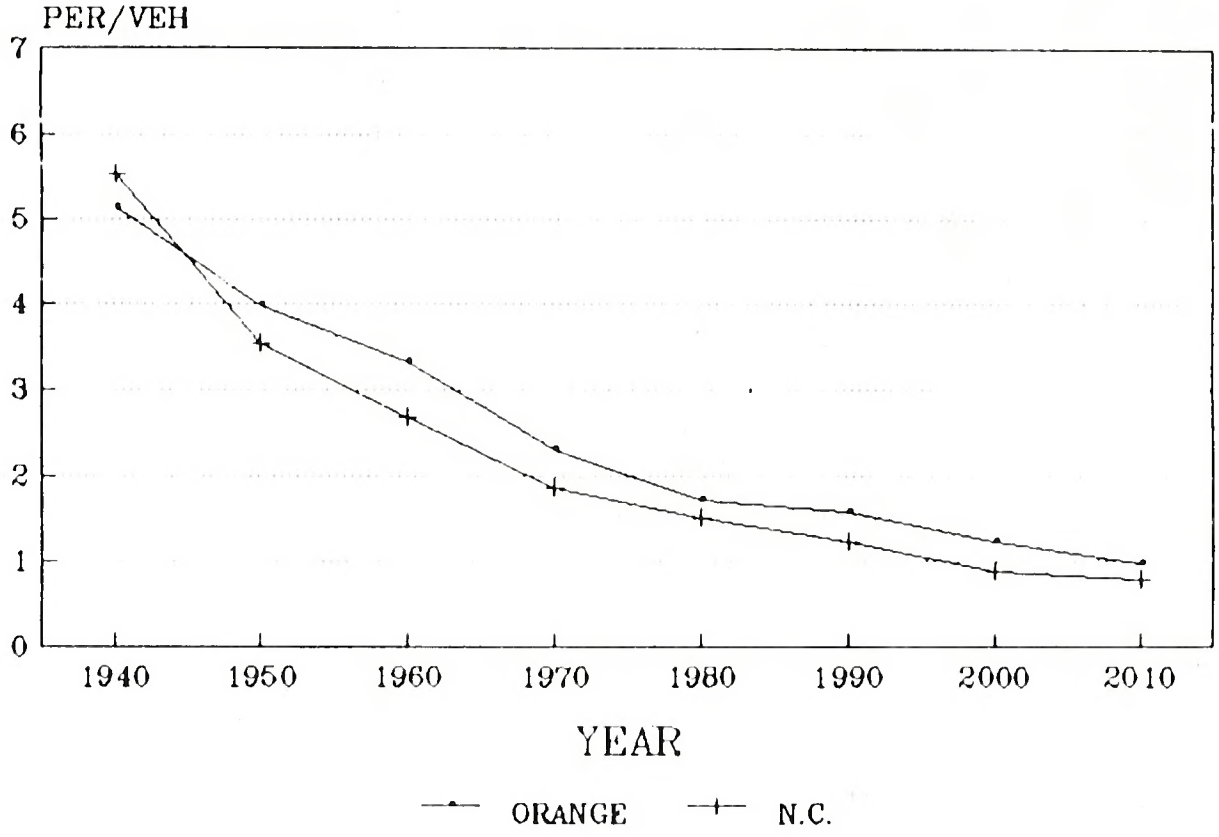


FIGURE 4

1) More automobiles were purchased due to their availability before and after WWII.

2) The economic activity changed from one formed mainly from agriculture to one with more diverse origins.

3) The standards of living increased, which allowed for a larger purchase of automobiles.

4) A larger amount of drivers existed due to the post-war "baby-boom" occurring in the sixties.

Since the early 1970's, these reasons for purchasing more automobiles have had less influence and have led to the expectation that the persons per vehicle rate will begin to stabilize trip-making characteristics for families in the middle and upper income categories due to the fact that they already have the financial means to purchase a sufficient number of vehicles to satisfy their transportation needs. On the other hand, moderate growth in the trip-making characteristics of lower income families is projected due to an expected improvement in their financial well-being.

Vehicle registration in North Carolina has risen from 2,742,643 in 1970 to 3,896,544 in 1980. Table 3 shows this as an increase of 42 percent.

IV. EXISTING TRAFFIC CONDITIONS IN COUNTY

Capacity, Width, and Alignment Deficiencies

Due to the increase in population and number of registered vehicles in Orange County over the past decades, some of the roads built in the past and not recently repaired may not withstand the anticipated load of cars using these roads. Capacity, width, and alignment designs with which they were built may limit their potential to facilitate this demand. Land use plays a part in the "erosion" of these roads. As land develops the road serving this land may become inadequate due to the increased usage.

Depending on the factors mentioned above, the design requirements for thoroughfares vary. Using general design requirements for roads is undesirable, due to the different land uses, population amounts, and traffic volumes that can occur along different sections of a given thoroughfare. Each section of a given road must be individually analyzed and its design requirements determined on the basis of amount and type of projected traffic, existing capacity, desired levels of service, and available right-of-way.

The term **level of service** denotes any of an infinite number of differing combinations of operating conditions that can occur on a given lane or roadway when it is accommodating various traffic volumes.(1) Six levels of service exist (levels A through F, shown in Figure 5), which, by using effects from such factors as travel time, speed, cost, and maneuverability, determine the type of service that the thoroughfare gives to the motorist under the stated conditions. The six levels are defined as follows:

1) Level A: free flow at low densities with no restrictions due to traffic conditions.

2) Level B: stable flow with some slight restriction of driver freedom. This is often used for the design of rural highways.

3) Level C: stable flow with increased marked restriction on the driver's selection of speed and with reduced ability to pass.

4) Level D: decreased flow with little freedom for driver maneuverability. The operating speeds are still tolerable; however, this region approaches the condition of unstable flow.

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1 Highway Engineering (4e) , Wright & Paquette, pg. 126, 1979.

5) Level E: unstable flow, with low operating speeds and volumes near or at capacity.

6) Level F: "traffic jam" conditions, with frequent interruptions and breakdown of flow. Volumes below capacity exist along with low operating speeds.(2)

As stated above, the effect of speed on traffic is a factor that determines the type of level of service given to the motorist. The term used for this speed effect is the overall travel speed, which is the total distance traveled divided by the total time required, including all traffic delays.
The recommended minimum levels of service for roads and highways included in the proposed Orange County Thoroughfare Plan are given in Table 4.

Table 4

Minimum Levels of Service for Thoroughfares in Orange County	
Facility	Overall Travel Speed During Peak Traffic Conditions
Major and Minor Arterials	50 - 55 MPH
Major Collector Roads	45 - 50 MPH
Minor Collector Roads	40 MPH

According to most motorists, the optimum safety and operation of most roads would exist through widening all existing and building all new roads to provide a minimum lane width of 12 feet. However, to build such roads would be impractical considering overall statewide needs and available highway revenues. Therefore, minimum tolerable widths, shown in Table 5, were established for existing roads with respect to traffic demands which are economically feasible.

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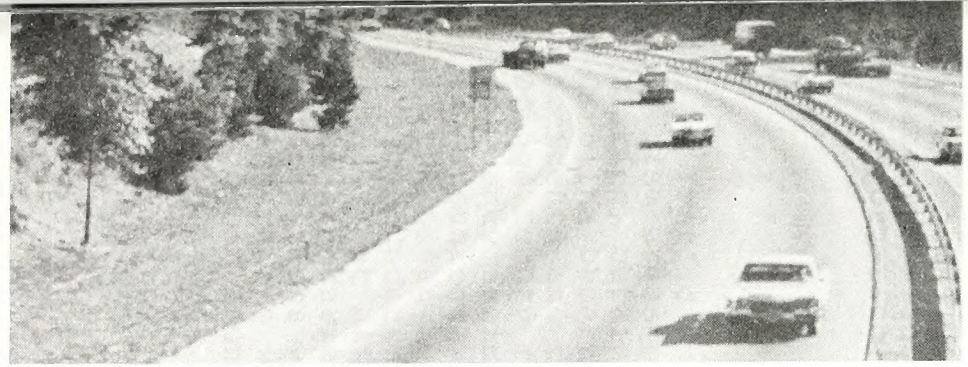
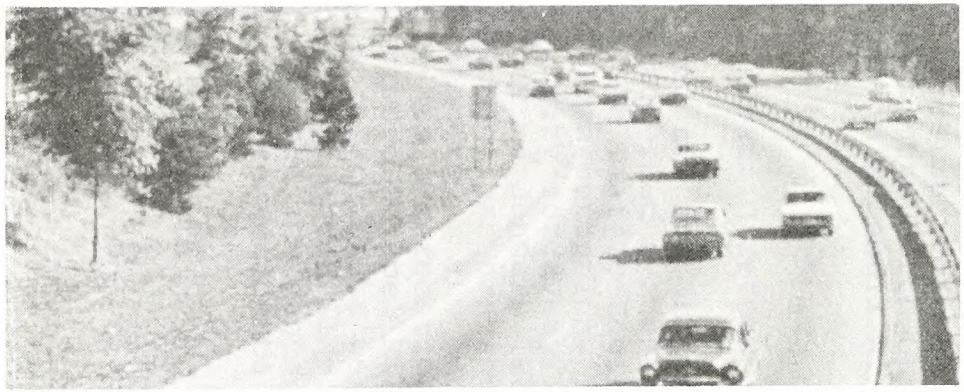
2 Ibid, pgs. 126-128.

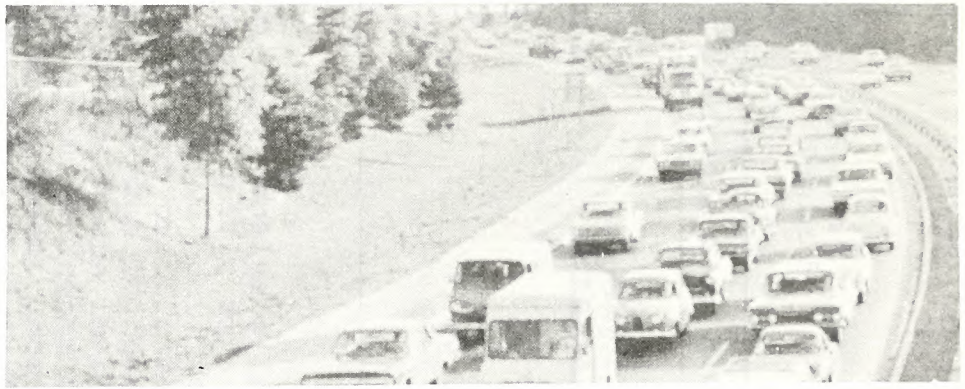


LEVEL OF SERVICE - A

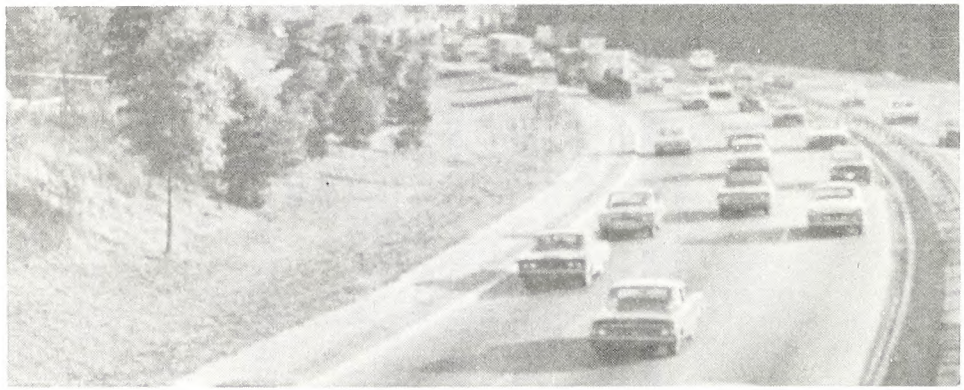
LEVEL OF SERVICE - D



LEVEL OF SERVICE - B



LEVEL OF SERVICE - E



LEVEL OF SERVICE - C

LEVEL OF SERVICE - F

LEVELS OF SERVICE

FIGURE 5

Table 5

Minimum Tolerable Lane Widths (ft)			
ADT	Principal Arterials	Minor Arterials	Collectors
Over 2,000	11	11	11
400-2,000	--	10	10
100 - 400	--	10	9
Below 100	--	--	9

The capacity deficiency analysis is a method used to determine if the projected traffic on a given thoroughfare would exceed the practical capacity of this road. The projected traffic year used was 2010. The past traffic volume trends and tolerable lane widths, along with the capacity deficiency analysis, were used to determine the thoroughfare improvements for the Orange County Thoroughfare Plan. This information is listed in Appendix B, along with recommended pavement cross sections for roads requiring widening. These roads were recommended to be widen to either 22 or 24 feet depending on the projected traffic volumes on these roads. Typical cross sections recommended by the Statewide Planning Unit of the North Carolina Department of Transportation are shown in Appendix A.

Traffic Safety

Traffic accident reports are of assistance in locating problem areas on the state road system. The 1989 Safety Program Listing, obtained from the Traffic Engineering Branch of the North Carolina Department of Transportation, shows the number of accidents and their severity for every intersection located in Orange County for the period January 1986 - June 1989. The high frequency accident intersections are shown in Table 6. These intersections were chosen due to the amount of accidents occurring at the given location. The intersections located outside the urban boundaries of Carrboro, Chapel Hill, and Hillsborough (rural areas) that had 10 or more accidents were listed. Inside the urban boundaries of Carrboro and Hillsborough, only the intersections with 20 or more accidents are shown. The intersections with 40 or more accidents are shown for the Chapel Hill urban boundary.

Table 6

ORANGE COUNTY
HIGH FREQUENCY ACCIDENT INTERSECTIONS
JANUARY 1986-JUNE 1989

INTERSECTION	TOTAL AMOUNT	SEVERITY INDEX
RURAL		
I-85 / US 70	12	10.05
I-85 / NC 86	21	16.90
I-85 / SR 1009	19	10.03
I-85 / SR 1120	13	17.65
US 15 / SR 1008	10	14.54
US 70 / SR 1002	18	15.04
US 70 / SR 1560	12	7.03
US 70 / SR 1562	11	7.58
US 70 / SR 1706	13	10.02
US 70 / SR 1715	10	2.80
NC 57 / NC 86	14	14.55
URBAN - CARRBORO		
NC 54 / MAIN ST	22	16.57
GREENSBORO / MAIN	24	15.66
MAIN / ROSEMARY	23	12.81
URBAN - CHAPEL HILL		
US 15 / ELLIOT	44	8.40
US 15 / EASTOWNE	56	10.36
US 15 / MANNING	45	9.83
US 15 / WILLOW	43	8.98
AIRPORT / ESTES	58	14.52
COLUMBIA / ROSEMARY	64	13.25
COLUMBIA / FRANK	59	7.90
ELLIOT / FRANK	40	5.98
ESTES / FRANK	88	7.48
FRANK / HENDERSON	62	9.44
URBAN - HILLSBOROUGH		
I-85 / CHURTON	24	7.79
US 70 / NC 86	28	10.03
CHURTON / CORBIN	22	6.33
CHURTON / KING	24	11.14
CHURTON / MARGARET	23	6.89

Bridge Conditions

Bridges are a necessary and unique element of a highway system. They represent the highest unit investment of all elements of the system. If any inadequacies or deficiencies exist in a bridge, the value of the total investment of the system is reduced. The community welfare can be disrupted if the structural system of a bridge fails, but more importantly loss of life can also occur. For these reasons, bridges must be constructed to the same or higher design standards as the highway system of which they are a part.

Congress enacted the National Bridge Inspection Program Standards on April 27, 1971, implementing the Federal Highway Act of 1968. These standards require that "all structures defined as bridges located on and of the Federal-Aid Highway Systems be inspected and the safe load carrying capacity computed at regular intervals, not to exceed two years." A sufficiency index number has been calculated for each bridge for the purpose of establishing eligibility and priority for replacement. The bridges with the highest priority are replaced as Federal-Aid funds and State funds are made available. Additional funds have recently been provided by Congress specifically for bridge replacement.

A sufficiency rating is used in the analysis to determine the deficiency of a particular bridge. The sufficiency rating is a method of evaluating factors which are indicative of bridge sufficiency to remain in service. Some factors used are: structural adequacy and safety, serviceability and functional obsolescence, structure type, and traffic safety features. This method yields a percentage in which 100 percent would represent an entirely sufficient bridge and zero percent would represent an entirely insufficient or deficient bridge. A sufficiency rating of 50 percent or less qualifies for Federal Bridge Replacement funds.

Table 7 shows functionally obsolete bridges with sufficiency ratings of 50 percent and less, with a reference to their location on Figure 6. There are 114 bridges located in Orange County, with 32 functionally obsolete bridges with a sufficiency rating of 50 percent or less. There are currently four bridge projects included in the current Transportation Improvement Program.

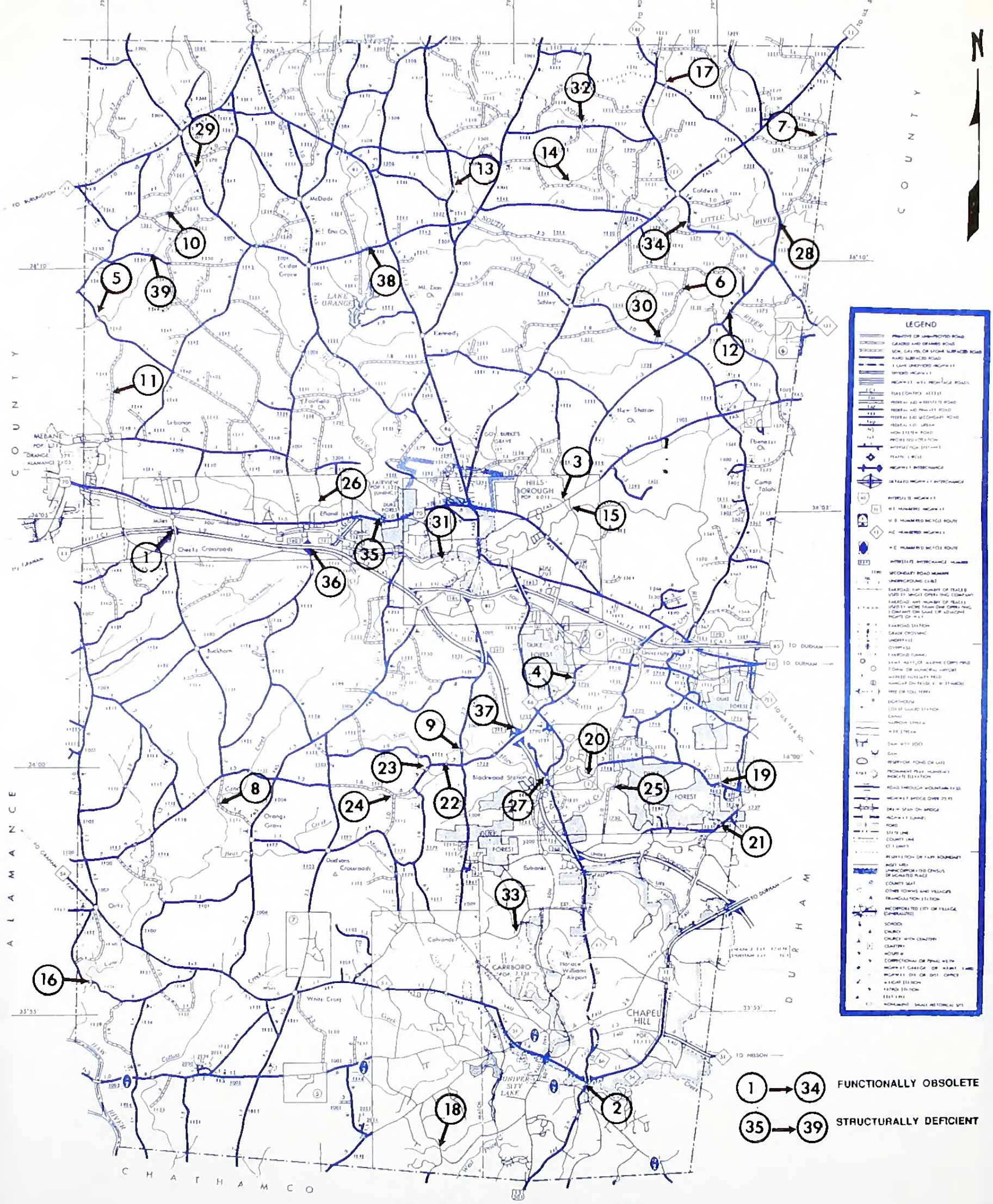
Table 7 also shows structurally deficient bridges, with a reference to their location on Figure 7.

TABLE 7

FUNCTIONALLY OBSOLETE AND
STRUCTURALLY DEFICIENT BRIDGES
IN ORANGE COUNTY

MAP INDEX	LOCATION OF FUNCTIONALLY OBSOLETE BRIDGES	SUFFICIENCY RATING (%)
1	SR 1114 @ I-40 & I-85	50.0
2	SR 1919 @ MORGAN CREEK	49.6
3	SR 1002 @ STROUDS CREEK	49.2
4	SR 1723 @ NEW HOPE CREEK	49.1
5	SR 1340 @ CREEK	49.0
6	SR 1540 @ S. FORK LITTLE RIVER	48.5
7	SR 1534 @ PRONG LITTLE RIVER	48.3
8	SR 1114 @ CANE CREEK	48.3
9	SR 1009 @ NEW HOPE CREEK	48.0
10	SR 1362 @ CREEK	47.9
11	SR 1346 @ CREEK	47.2
12	SR 1538 @ S. FORK LITTLE RIVER	47.1
13	SR 1507 @ S. FORK LITTLE RIVER	45.2
14	SR 1508 @ S. FORK LITTLE RIVER	43.9
15	SR 1561 @ ENO RIVER	43.9
16	SR 1958 @ CANE CREEK	43.9
17	SR 1524 @ STING CREEK	42.9
18	SR 1940 @ PRICE CREEK	42.5
19	SR 1718 @ CREEK	42.2
20	SR 1718 @ CREEK	41.5
21	SR 1734 @ NEW HOPE CREEK	40.5
22	SR 1113 @ NEW HOPE CREEK	39.1
23	SR 1113 @ NEW HOPE CREEK	39.1
24	SR 1113 @ NEW HOPE CREEK	39.1
25	SR 1730 @ OLD FIELD CREEK	37.1
26	SR 1324 @ MCGOWAN CREEK	36.9
27	NC 86 @ NEW HOPE CREEK	36.6
28	SR 1538 @ N. FORK LITTLE RIVER	36.0
29	SR 1004 @ CREEK	35.8
30	SR 1548 @ S. FORK LITTLE RIVER	32.7
31	SR 1148 @ ENO RIVER	32.5
32	SR 1517 @ N. FORK LITTLE RIVER	31.8
33	SR 1777 @ BOLIN CREEK	31.5
34	NC 157 @ N. FORK LITTLE RIVER	23.3
MAP INDEX	**LOCATION OF STRUCTURALLY DEFICIENT BRIDGES**	**SUFFICIENCY RATING (%)**
35	US 70 BUSINESS @ ENO RIVER	61.5
36	I-40 & I-85WBL @ SR 1120	37.0
37	SR 1723 @ STONEY CREEK	28.5
38	SR 1352 @ PRONG ENO CREEK	23.0
39	SR 1350 @ CREEK	22.2

See Figure 6 for locations of bridges on Orange County Map.



ORANGE COUNTY
NORTH CAROLINA

BRIDGE LOCATION MAP
FUNCTIONALLY OBSOLETE AND STRUCTURALLY DEFICIENT BRIDGES

FUNCTIONALLY OBSOLETE

Functionally obsolete bridges are those which are narrow, have inadequate underclearances, have insufficient load carrying capacity, or are poorly aligned with the roadway and can no longer adequately service today's traffic.

STRUCTURALLY DEFICIENT

Structurally deficient bridges are those which are in relatively poor condition or have insufficient load carrying capacity which may be due to original design or deteriorations.

SCALE

FIGURE 6

V. THOROUGHFARE PLAN

The recommended thoroughfare plan for Orange County is shown in Figure 8. Elements of the plan are initially classified as urban or rural. The areas around Carrboro, Chapel Hill, Hillsborough, and Mebane are delineated as urban thoroughfare planning areas since a mutually approved thoroughfare plan exists between NCDOT and the municipality. Elements of the Orange County Plan area are as follows:

Principle Arterials

I-85/I-40: From Alamance County to Durham County

Minor Arterials

NC 54: From Alamance County to SR 1207

Major Collectors

US 70: From Mebane ECL to SR 1312
NC 49: From Alamance County to Caswell County
NC 57: From SR 1552 to Person County
NC 86: From SR 1001 to Caswell County
NC 157: From SR 1597 to Person County
SR 1004: From SR 1357 to SR 1332
SR 1005: From Alamance County to SR 1947
SR 1006: From NC 54 to SR 1115

Minor Collectors

SR 1001: From NC 86 to Person County
SR 1004: From SR 1367 to SR 1352
SR 1007: From Alamance County to NC 54
SR 1102: From NC 54 to SR 1115
SR 1114: From US 70 to SR 1115
SR 1115: From SR 1006 to SR 1114
SR 1117: From SR 1007 to SR 1120
SR 1120: From SR 1117 to SR 1136
SR 1144: From US 70 to SR 1120
SR 1177: From SR 1006 to SR 1113
SR 1306: From SR 1346 to SR 1341
SR 1341: From SR 1350 to SR 1339
SR 1343: From SR 1306 to SR 1004
SR 1350: From SR 1364 to SR 1341
SR 1352: From SR 1004 to NC 86
SR 1364: From Alamance County to NC 49
SR 1367: From Alamance County to SR 1004
SR 1507: From Person County to SR 1001
SR 1543: From SR 1001 to NC 57
SR 1545: From NC 86 to SR 1001
SR 1548: From NC 57 to SR 1540
SR 1951: From Chatham County to NC 54

REVISIONS		
ADOPTED BY ORANGE COUNTY	APPROVAL PLANNING & RESEARCH	ADOPTED BY N.C. BOARD of TRANSPORTATION

ADOPTED BY ORANGE COUNTY _____

RECOMMENDED APPROVAL BY PLANNING & RESEARCH BRANCH _____

ADOPTED BY NORTH CAROLINA DEPARTMENT of TRANSPORTION _____

PUBLIC HEARING DATES

LEGEND		
CLASSIFICATION	EXISTING	PROPOSED
INTERSTATE		
URBAN MAJOR THOROUGHFARE *		
URBAN MINOR THOROUGHFARE *		
URBAN THOROUGHFARE PLANNING BOUNDARY *		

COUNTY CLASSIFICATION	STATE CLASSIFICATION
MINOR ARTERIAL	RURAL MAJOR COLLECTOR
COLLECTOR	RURAL MINOR COLLECTOR
PRINCIPAL ARTERIAL	RURAL MINOR ARTERIALS

* URBAN PORTION OF PLAN SUBJECT TO CHANGE

RECOMMENDED

ORANGE COUNTY

THOROUGHFARE PLAN

NORTH CAROLINA

6 FEBRUARY 1990

SCALE

0 4,000 8,000 12,000 16,000

1" = 4,000

In the rural areas of the county, there was no need for the routing of any new thoroughfares. The main objective of the Orange County Thoroughfare Plan is to improve any existing roads that are frequently used and are not adequate enough to support the current or anticipated traffic volume. One of the requirements of the Highway Bill passed on July 27, 1989 was to have every unpaved road on the North Carolina State System with an ADT of 50 or more vehicles per day paved. Therefore, this is an objective of the Orange County Thoroughfare Plan. There are numerous and necessary widenings that should occur throughout the Orange County rural area. A listing of these roads can be found in Appendix B. The existing and future right-of-way and pavement widths are shown in this listing.

Due to the general paving of all unpaved roads, a cost estimate for specific thoroughfares is unnecessary. The unpaved roads in Orange County will become two-lane shoulder sections. The average cost for these types of thoroughfares is $170 per foot, or $900,000 per mile. All widening from 18'-20' to 22' or 24' has an average cost of $75.76 per foot, or $400,000 per mile. This information was obtained from Mr. Doug Lang in the Cost Estimating Department of the North Carolina Department of Transportation.

The projects currently listed in the Transportation Improvement Program for Orange County are as follows:

1) I-304: I-85, from east of NC 54 to west of SR 1134; Alamance-Orange Counties; widening from existing four lanes to eight lanes; scheduled for completion in 1995.

2) I-305: I-85, from SR 1006 to Durham County; widening from existing four lanes to eight lanes; scheduled for completion after 1996.

3) R-2358: NC 54, from I-40/I-85 in Burlington to Chapel Hill Bypass. Widen existing roadway to a four lane divided facility. Scheduled for a feasibility study.

Projects inside of Urban Areas

1) R-2630: Durham Loop, I-85 West to I-85 North. Begin construction after 1996.

2) U-2002: Main Street, North Greensboro Street, and Hillsborough Road, widen existing roadway to a curb and gutter facility with bike lanes. Completion in 1992.

3) U-2003: US 15-501 & NC 54, west of Carrboro to US 501 Bus., widen existing two lanes to four lanes. Completion in 1993.

4) U-2302: NC 86, SR 1777 to I-40, widen existing roadway

to a multi-lane facility. Construction to start in 1996.

5) U-624: NC 86 (South Columbia Street), US 15-501 bypass to Manning Drive, widen existing roadway to a five lane facility. Construction to start in 1993.

Bridge Projects

1) B-2598: North Fork Little River, replace Bridge No. 54 on NC 157. Completion 1995

2) B-2100: Bridge No. 101, along SR 1005; Alamance-Orange Counties; replacement of bridge over Haw River; scheduled for completion after 1994.

3) B-2599: Eno River, replace Bridge No. 185 on SR 1148. Completion 1993.

4) B-2157: Morgan Creek, replace Bridge No. 88 on SR 1919. Completion 1991.

VI. IMPLEMENTATION

There are several tools which are available for use by a county to assist in the implementation of a Thoroughfare Plan. They are as follows:

State-County Adoption of Thoroughfare Plan

If requested, the Department of Transportation, in cooperation with a county, will cooperatively develop and mutually approve a county thoroughfare plan. The mutually adopted plan would serve as a guide to the Department of Transportation in the development of the road and highway system of the County. The approval of the plan by the County will enable standard regulations and land use controls to be used effectively to assist in the implementation of the plan.

Subdivision Controls

The subdivision regulations require every subdivider to submit to the county planning commission a plan of the proposed subdivision and requires that the subdivision be constructed to certain standards. Through this process, it is possible to require the subdivision streets to conform to the thoroughfare plan and to reserve or protect necessary right-of-way for projected roads and highways that are to become a part of the thoroughfare plan. The construction of subdivision streets to adequate standards would reduce maintenance costs and will facilitate the transfer of the streets to the State Highway System. Appendix D outlines the recommended design standards.

Land Use Controls

Land use regulations are an important tool in that they regulate future land development and minimize undesirable development along roads and highways. The land use regulatory system can improve highway safety by requiring sufficient building setbacks to provide for adequate sight distances and by requiring off-street parking.

Funding

The majority of the improvements are scheduled and funded by the Transportation Improvement Program. The Board of Transportation regularly conducts public meetings to obtain input from the public of their needs for highway improvements.

However, not all roadway improvements are covered by this procedure. Nearly all secondary road work is done on a county-by-county basis. These funds (county construction account) are used

to pave unimproved roads, widen roadways, stabilize unpaved roads, make minor alignment improvements, and even construct short connectors when appropriate. The county commissioners are encouraged to work with the Division Engineer when the county's priority list is developed. Many of the minor improvements recommended may be realized by using the county's construction account funds and cooperatively developing the county's priority list with the Division Engineer.

ORANGE COUNTY THOROUGHFARE PLAN REPORT

APPENDICES

APPENDICES

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A-3. ADOPTED CHAPEL HILL-CARRBORO THOROUGHFARE PLAN . 57

A-4. PROPOSED DURHAM-CHAPEL HILL-CARRBORO
THOROUGHFARE PLAN 59

APPENDIX A

NCDOT RECOMMENDED TYPICAL CROSS SECTIONS

Typical Cross Sections

Typical cross sections recommended by the Thoroughfare Planning Unit are shown in Appendix A, Figure 1, and listed in Appendix B, Table 1.

Cross section "A" is illustrative for controlled access freeways. The 46 foot grassed median is the least desirable median width but there could be some variation from this depending upon design considerations. Slopes of 8:1 into 3 foot drainage ditches are desirable for traffic safety. Right-of-way requirements would typically vary upward from 250 feet depending upon cut and fill requirements.

Cross section "B" is typical for four lane divided highways in rural areas which may have only partial or no control of access. The minimum median width for this cross section is 30 feet, but a wider median is desirable. Design requirements for slopes and drainage would be similar to cross section "A", but there may be some variation from this depending upon right-of-way constraints.

Cross section "C", seven lane urban, and cross section "D", five lane urban, are typical for major thoroughfares where frequent left turns are anticipated as a result of abutting development or frequent street intersections.

Cross sections "E" and "F" are used on major thoroughfares where left turns and intersecting streets are not as frequent. Left turns would be restricted to a few selected intersections.

Cross section "G" is recommended for urban boulevards or parkways to enhance the urban environment and to improve the compatibility of major thoroughfares with residential areas. A minimum median width of 24 feet is recommended with 30 feet being desirable.

Typical cross section "H" is recommended for major thoroughfares where projected travel indicates a need for four travel lanes but traffic is not excessively high, left turning movements are light, and right-of-way is restricted. An additional left turn lane would probably be required at major intersections.

Thoroughfares which are proposed to function as one-way traffic carriers would typically require cross section "I". Cross section "J" and "K" are usually recommended for minor thoroughfares since these facilities usually serve both land service and traffic service functions. Cross section "J" would be

used on those minor thoroughfares where parking on both sides is needed as a result of more concentrated development.

Cross section "L" is used in rural areas or for staged construction of a wider multi-lane cross section. On some thoroughfares projected traffic volumes may indicate that two travel lanes will adequately serve travel for a considerable period of time.

The curb and gutter urban cross sections all illustrate the sidewalk adjacent to the curb with a buffer or utility strip between the sidewalk and the minimum right-of-way line. This permits adequate setback for utility poles. If it is desired to move the sidewalk further away from the street to provide added separation for pedestrians or for aesthetic reasons, additional right-of-way must be provided to insure adequate setback for utility poles.

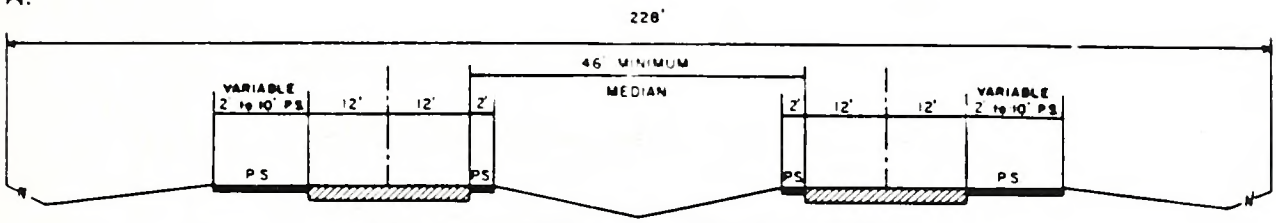
Rights- of-way shown for the typical cross sections are the minimum rights-of-way required to contain the street, sidewalks, utilities, and drainage facilities. Cut and fill requirements may require wither additional right-of-way or construction easements. Obtaining construction easements is becoming the more common practice for urban thoroughfare construction.

If there is sufficient bicycle traffic along the thoroughfare to justify a bicycle lane or bikeway, additional right-of-way may be required to allow for the bicycle facilities. The North Carolina Bicycle Facility and Program Handbook should be consulted for design standards for bicycle facilities.

Recommended typical cross sections for thoroughfares were derived on the basis of projected traffic, existing capacities, desirable levels of service and available right-of-way.

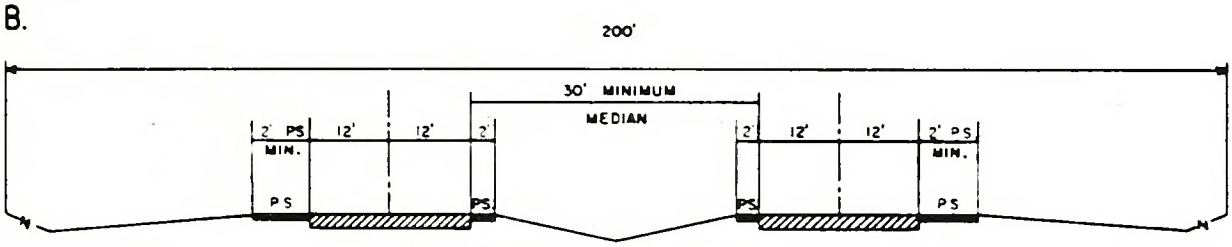
TYPICAL THOROUGHFARE CROSS SECTIONS

A.



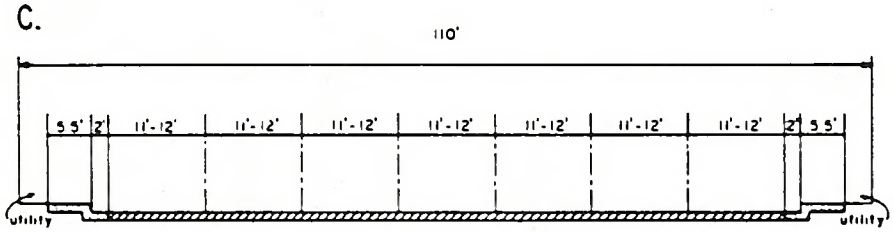
FOUR LANES DIVIDED WITH MEDIAN - FREEWAY

B.



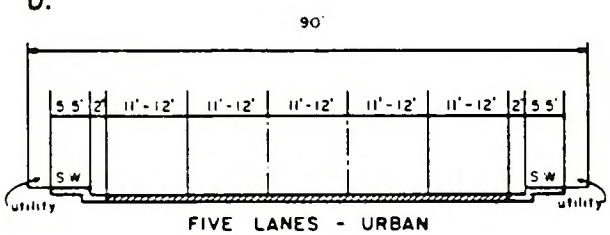
FOUR LANES DIVIDED WITH MEDIAN - RURAL

C.



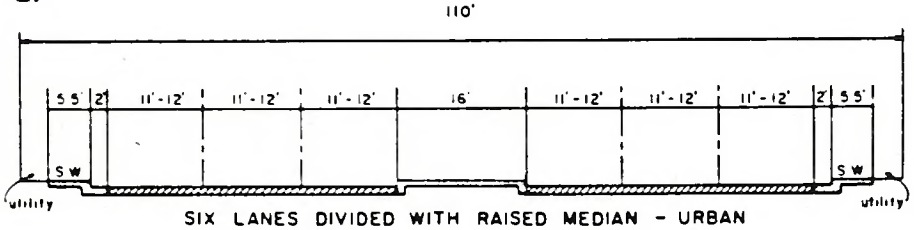
SEVEN LANES - URBAN

D.



FIVE LANES - URBAN

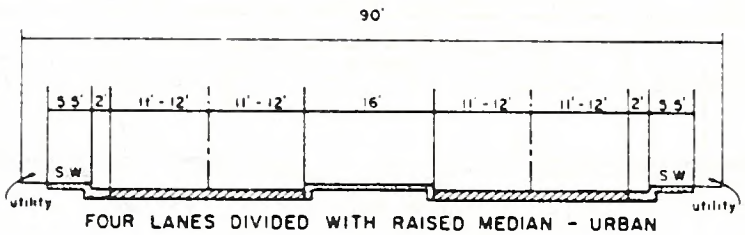
E.



SIX LANES DIVIDED WITH RAISED MEDIAN - URBAN

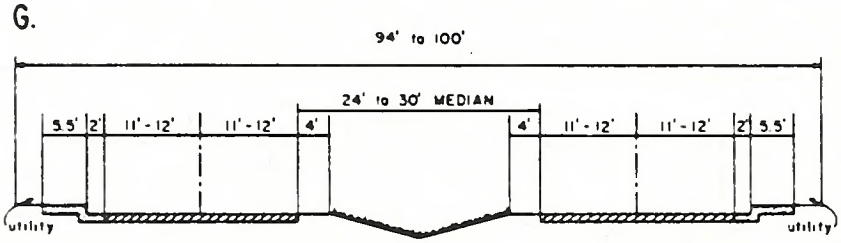
TYPICAL THOROUGHFARE CROSS SECTIONS
(CONTINUED)

F.



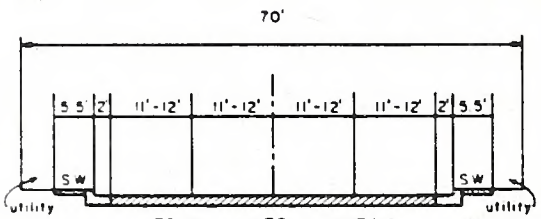
FOUR LANES DIVIDED WITH RAISED MEDIAN - URBAN

G.



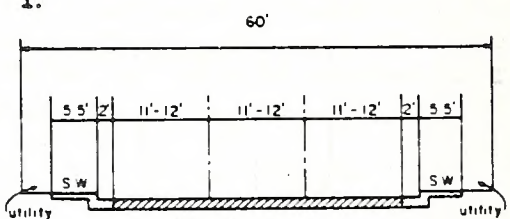
FOUR LANES DIVIDED - URBAN BOULEVARD
GRASS MEDIAN

H.



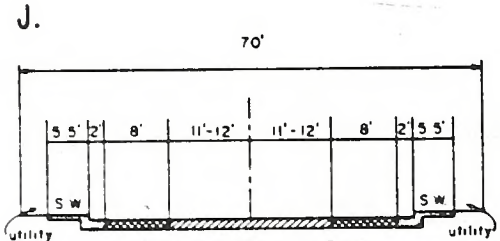
FOUR LANES - URBAN

I.



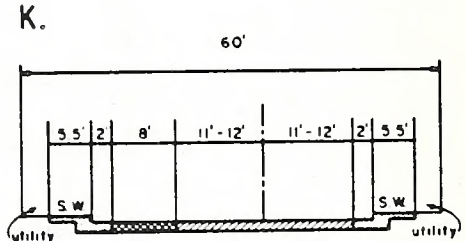
THREE LANES - URBAN

J.



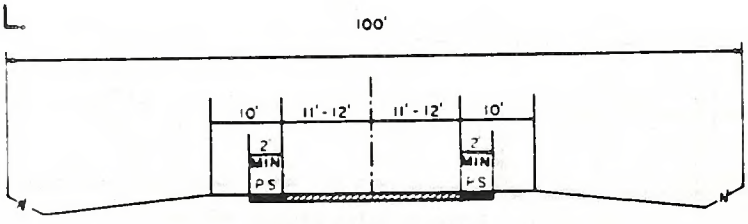
TWO LANES - URBAN
PARKING ON EACH SIDE

K.



TWO LANES - URBAN
PARKING ON ONE SIDE

L.

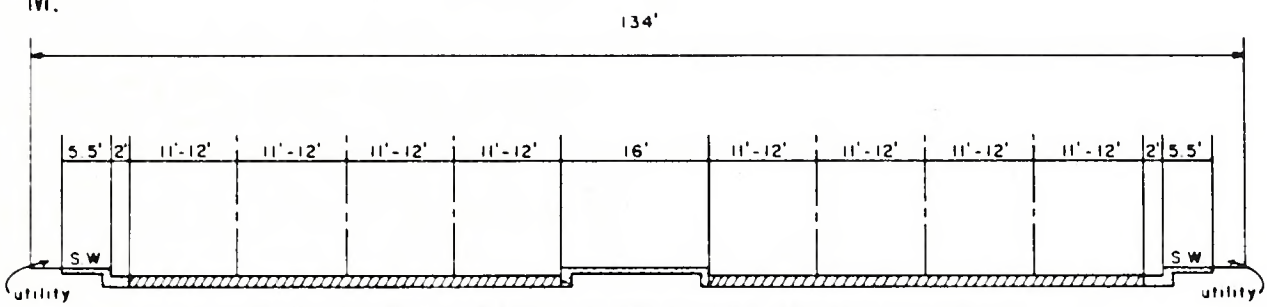


TWO LANES - RURAL

TYPICAL THOROUGHFARE CROSS SECTIONS

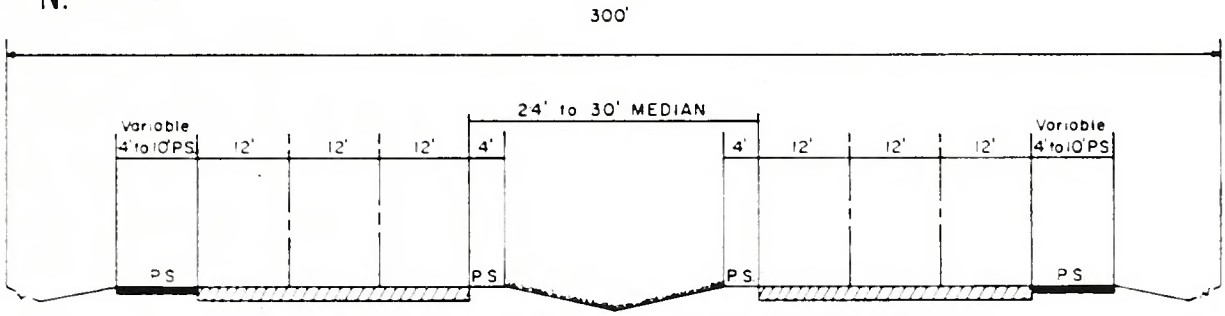
(CONTINUED)

M.



EIGHT LANES DIVIDED WITH RAISED MEDIAN - URBAN

N.



SIX LANES DIVIDED - RURAL FREEWAY
GRASS MEDIAN

APPENDIX B

STREET INDEX

The Street Index is a tabulation of the roads on the state system that have been placed into the thoroughfare plan. This index shows the proposed changes of these roads due to their anticipated traffic (future average daily traffic or future ADT). These changes made were widenings of the existing widths and rights-of-way of these roads. The future ADT's were computed by a linear progression of the ADT's of each thoroughfare from past years. Using the minimum tolerable lane widths (Table 5, Page **23**), the future lane widths were assigned to the roads. Capacity is a term expressed as the number of vehicles that can pass a given point in a certain period of time at a given speed. The capacities shown are the maximum amounts of traffic each road can carry at a Level Of Service "E".

The following abbreviations were used in the Street Index:

X-SECTION - Roadway width or cross-section of road.
DIST - Distance or length of described section in miles.
RDWY - Roadway
ROW - Right-of-way
ADTS - Average daily traffic in vehicles per day.
MI - Miles
FT - Feet
ADQ - Existing is adequate.
A,B,C...M,N - Designates type of cross-section recommended for this segment of road. (Refer to Appendix A)

APPENDIX B

ORANGE COUNTY THOROUGHFARE PLAN STREET TABULATION AND RECOMMENDATIONS

FACILITY & SECTION	EXISTING X - SECTION DIST MI	RDWY FT	ROW FT	CAPACITY CURRENT (FUTURE)	1987 ADTS	2010 ADTS	RECOMMENDED X - SECTION RDWAY	ROW
I-85								
ALAMANCE COUNTY-SR 1120	5.2	2x24	260	50000	32583	51800	2X48	300
SR 1120-US 70 ALT	0.6	2x24	260	50000	34400	54700	2X48	300
US 70 ALT-I-40 FUT	2.0	2x24	300	50000	33100	53600	2X48	300
I-40 FUT-SR 1006	0.9	2x24	300	50000	31300	50700	2X48	300
SR 1006-NC 86	1.7	2x24	300	50000	31300	50900	2X48	300
NC 86-US 70	4.2	2x24	260	50000	36000	56500	2X48	300
US 70- DURHAM COUNTY	1.5	2x24	260	50000	31800	55000	2X48	300
US 70								
MEBANE ECL-SR 1312	4.5	22	60	8500	4000	7500	ADQ	ADQ
NC 49								
ALAMANCE CO.-CASWELL CO.	5.4	20	60	7500	1500	2800	L-22	60
NC 54								
ALAMANCE COUNTY-SR 1207	7.0	24	120	10500	6500	12000	B	200
NC 57								
SR 1552-NC 157	4.5	20	100	7500	1700	2400	L-22	ADQ
NC 157-PERSON COUNTY	5.1	20	100	7500	1100	2400	L-22	ADQ
NC 86								
SR 1001-SR 1545	2.3	24	100	10500	5500	9200	ADQ	ADQ
SR 1545-SR 1508	2.5	24	60	10500	3000	7000	ADQ	ADQ
SR 1508-CASWELL COUNTY	4.1	24	60	10500	2300	6000	ADQ	ADQ
NC 157								
NC 57-PERSON COUNTY	4.0	20	60	7500	1600	2900	L-22	ADQ
BRADSHAW QUARRY (SR 1115)								
SR 1006-SR 1114	1.3	20	--	7500	500	1000	L-22	60
BUCKHORN RD. (SR 1114)								
US 70-SR 1115	6.6	20	--	7500	400	1000	L-22	60
BUTLER RD. (SR 1951)								
SR 1953-NC 54	1.0	20	60	7500	700	1100	L-22	ADQ
CARR STORE RD. (SR 1352)								
SR 1004-NC 86	1.9	18	--	6500	300	700	L-22	60
CARR STORE RD. (SR 1004)								
NC 49-SR 1343	3.3	18	--	6500	700	1200	L-22	60
SR 1343-SR 1352	1.4	18	--	6500	700	1200	L-22	60

APPENDIX B

ORANGE COUNTY THOROUGHFARE PLAN STREET TABULATION AND RECOMMENDATIONS

FACILITY & SECTION	EXISTING X - SECTION DIST MI	RDWY FT	ROW FT	CAPACITY CURRENT (FUTURE)	1987 ADTS	2010 ADTS	RECOMMENDED X - SECTION RDWAY	ROW
CEDAR GROVE RD. (SR 1357)								
NC 86-SR 1004	3.5	18	--	6500	200	500	L-22	60
CEDAR GROVE RD. (SR 1004)								
SR 1357-SR 1332	1.6	18	--	6500	900	1500	L-22	60
CLAIBORNE'S RD. (SR 1367)								
ALAMANCE COUNTY-SR 1004	1.0	20	60	7500	900	1400	L-22	ADQ
CORBETT RIDGE RD.(SR 1004)								
SR 1367-NC 49	2.2	18	--	6500	400	700	L-22	60
DAIRY LAND RD. (SR 1177)								
SR 1006-SR 1102	1.9	18	100	6500	600	1100	L-22	ADQ
SR 1102-SR 1113	1.4	18	100	6500	800	1300	L-22	ADQ
CRAWFORD DAIRY RD (SR 1956)								
CHATHAM COUNTY-SR 1005	1.4	22	--	8500	400	800	ADQ	60
DODSONS CROSSROADS(SR 1102)								
NC 54-SR 1115	5.1	20	60	7500	400	800	L-22	ADQ
GUESS RD (SR 1003)								
NC 57-SR 1597	2.1	20	--	7500	600	2000	L-22	60
HARMONY CHURCH RD								
(SR 1341) SR 1350-SR 1339	4.1	18	60	6500	100	200	L-22	ADQ
(SR 1350) SR 1364-SR 1341	1.5	20	60	7500	200	400	L-22	ADQ
HIGH ROCK RD. (SR 1340)								
SR 1341-ALAMANCE COUNTY	4.9	18	--	6500	300	500	L-22	60
JONES FERRY RD. (SR 1942)								
SR 1948-CHATHAM COUNTY	0.8	20	--	7500	2300	4000	L-22	60
LEBANON RD. (SR 1306)								
SR 1346-SR 1341	3.1	18	60	6500	800	1500	L-22	ADQ
LITTLE RIVER CH RD(SR 1543)								
SR 1001-NC 57	4.0	18	--	6500	300	500	L-22	60
LYNCH STORE RD. (SR 1364)								
ALAMANCE COUNTY-NC 49	3.6	18	--	6500	600	900	L-22	60

APPENDIX B

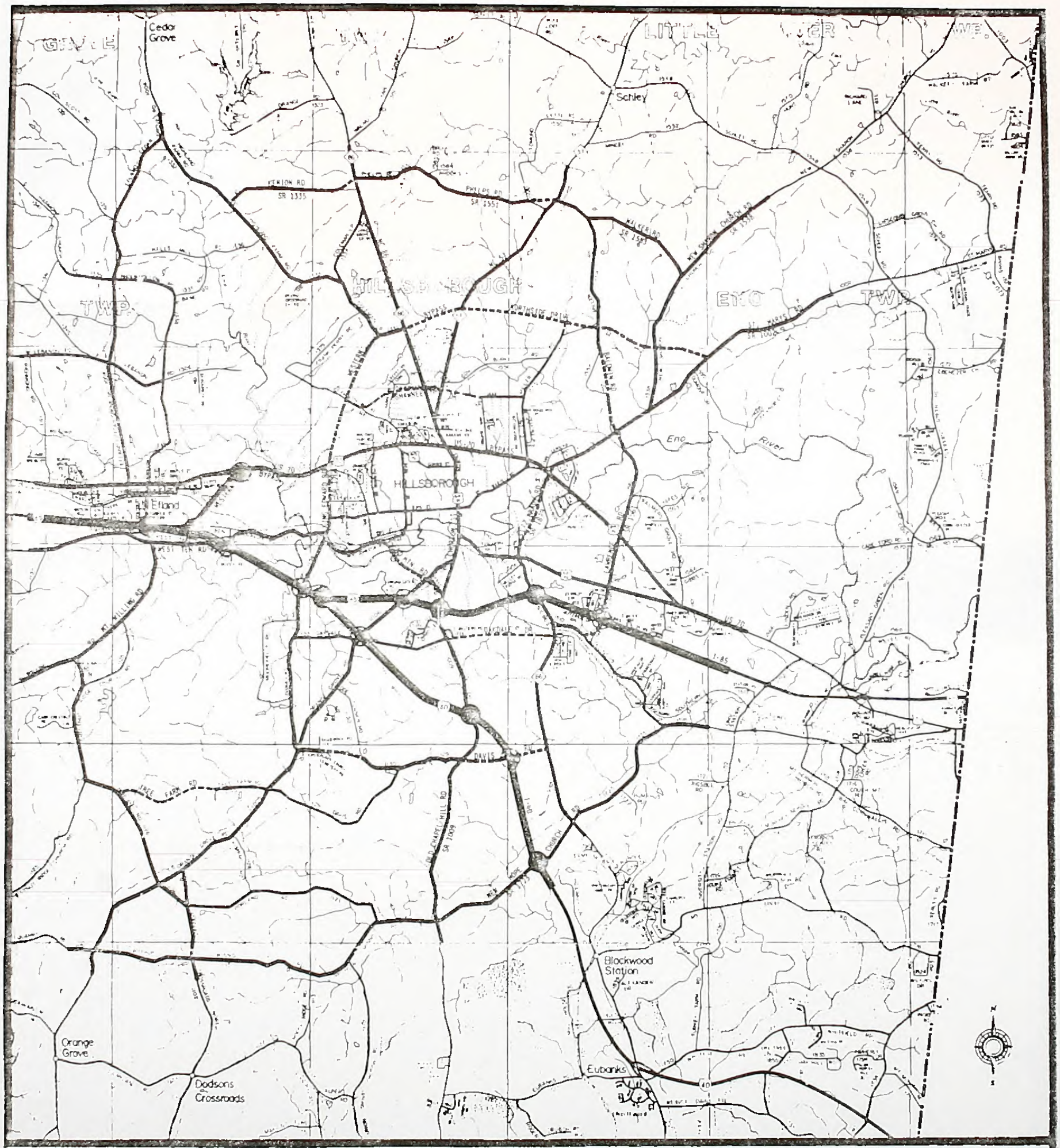
ORANGE COUNTY THOROUGHFARE PLAN STREET TABULATION AND RECOMMENDATIONS

FACILITY & SECTION	EXISTING X - SECTION DIST MI	RDWY FT	ROW FT	CAPACITY CURRENT (FUTURE)	1987 ADTS	2010 ADTS	RECOMMENDED X - SECTION RDWAY	ROW
MEBANE OAKS (SR 1007)								
ALAMANCE COUNTY-NC 54	6.9	18	60	6500	900	1600	L-22	ADQ
MILL CREEK RD. (SR 1343)								
SR 1306-SR 1340	1.9	20	60	7500	900	2000	L-22	ADQ
SR 1340-SR 1004	3.2	20	60	7500	600	1300	L-22	ADQ
MOUNT WILLING RD.(SR 1120)								
SR 1117-SR 1136	4.0	20	--	7500	400	700	L-22	60
OAK GROVE CH RD (SR 1117)								
SR 1007-SR 1120	0.7	20	60	7500	600	1100	L-22	ADQ
OLD GREENSBORO RD (SR 1005)								
ALAMANCE COUNTY-SR 1951	3.9	20	--	7500	1600	2900	L-22	60
SR 1951-SR 1947	2.3	18	--	6500	3000	6500	L-22	60
ORANGE CHAPEL CLOVER GARDEN RD. (SR 1956)								
SR 1005-NC 54	3.2	22	--	8500	500	900	ADQ	60
ORANGE GROVE RD. (SR 1006)								
NC 54-SR 1115	5.0	20	--	7500	600	1000	L-22	60
SAWMILL RD. (SR 1545)								
NC 86-SR 1001	2.0	18	--	6500	800	1500	L-22	60
SCHLEY RD. (SR 1548)								
NC 57-SR 1540	2.5	18	--	6500	700	1300	L-22	60
WALNUT GROVE RD. (SR 1001)								
NC 86-SR 1508	4.6	20	60	7500	1300	2200	L-22	ADQ
SR 1508-PERSON COUNTY	3.0	20	--	7500	700	1200	L-22	60
WEST TEN/MATTRESS FACTORY (SR 1144)								
US 70-SR 1120	3.6	20	60	7500	500	900	L-22	ADQ
WHITE CROSS RD. (SR 1951)								
CHATHAM COUNTY-SR 1952	2.8	20	60	7500	700	1200	L-22	ADQ
WILKERSON RD. (SR 1507)								
PERSON COUNTY-SR 1001	4.9	20	60	7500	400	700	L-22	60

APPENDIX C

URBAN THOROUGHFARE PLANS IN ORANGE COUNTY

	PLAN	ADOPTION
1.	HILLSBOROUGH	1987
2.	CHAPEL HILL-CARRBORO	1984
3.	DURHAM-CHAPEL HILL-CARRBORO	PROPOSED



LEGEND

	EXISTING	PROPOSED	LONG-RANGE
MAJOR THOROUGHFARES:			
FREEWAYS			
EXPRESSWAYS			
OTHERS			
MINOR THOROUGHFARES:			
GRADE SEPARATIONS:			
INTERCHANGES	●	◉	●
OVER/UNDERPASSES	○	◌	○

ADOPTED BY:
TOWN OF HILLSBOROUGH SEPTEMBER 21, 1987

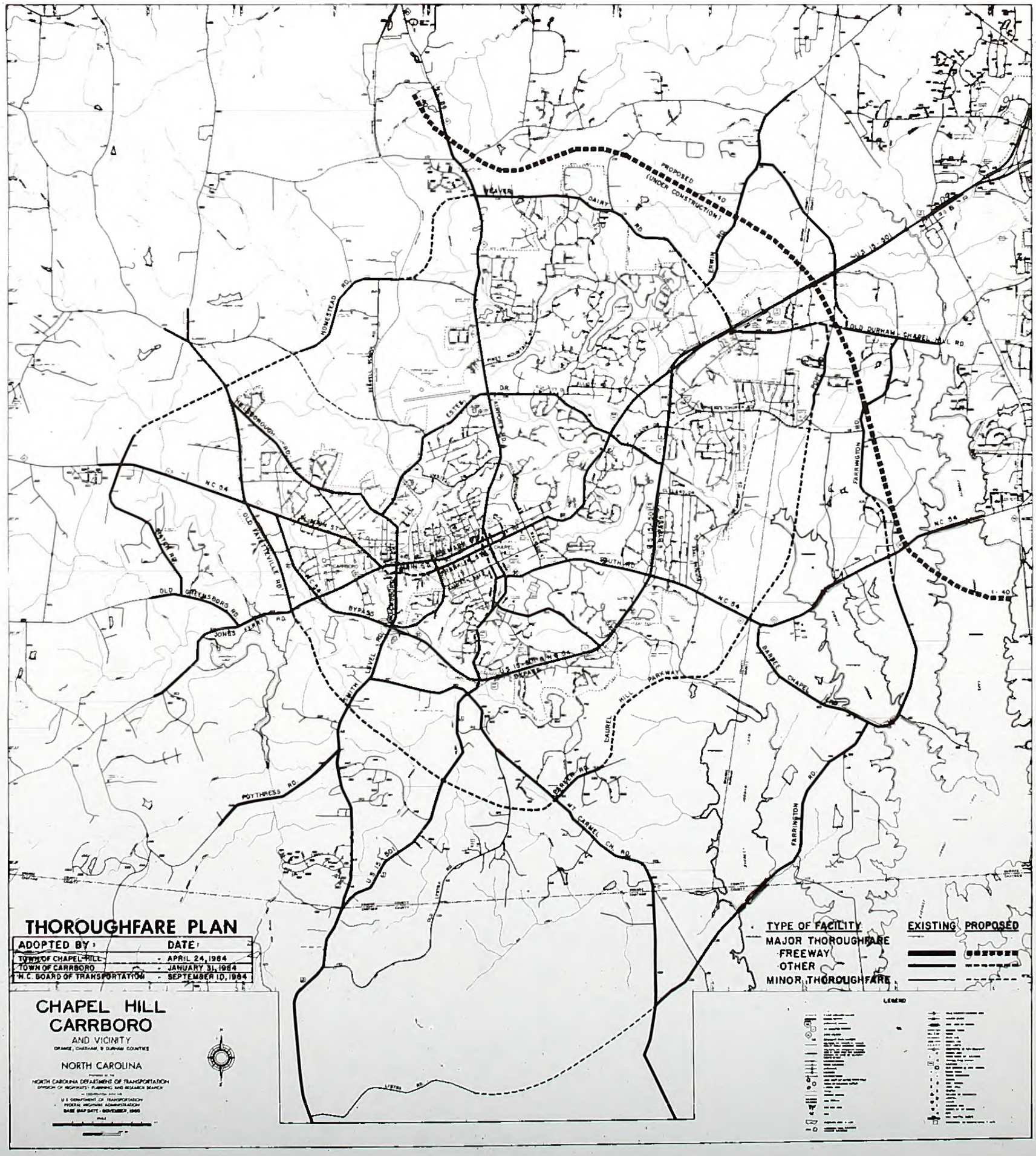
RECOMMENDED FOR APPROVAL BY
PLANNING AND RESEARCH BRANCH SEPTEMBER 29, 1987

ADOPTED BY THE NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION OCTOBER 9, 1987

HILLSBOROUGH THOROUGHFARE PLAN

AUGUST 27, 1987

SCALE: 0 0.5mi 1.0mi
0 4000 8000


THOROUGHFARE PLAN
ADOPTED BY : DATE :
TOWN OF CHAPEL HILL - APRIL 24, 1964
TOWN OF CARRBORO - JANUARY 31, 1964
N.C. BOARD OF TRANSPORTATION - SEPTEMBER 10, 1964
CHAPEL HILL
CARRBORO
AND VICINITY
ORANGE, CHATHAM, & DURHAM COUNTIES
NORTH CAROLINA
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS - PLANNING AND RESEARCH BRANCH
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
BASE MAP DATE - NOVEMBER, 1960
TYPE OF FACILITY
EXISTING
PROPOSED
MAJOR THOROUGHFARE
FREEWAY
OTHER
MINOR THOROUGHFARE
LEGEND
PROPOSED (UNDER CONSTRUCTION)
I-40
U.S. 15-501
N.C. 54
BYPASS
DUKE
WEAVER DAIRY RD.
HOMESTEAD RD.
ESTES DR.
AIRPORT RD.
OLD DURHAM-CHAPEL HILL RD.
FARRINGTON RD.
MLK JR. BLVD.
MAIN ST.
FRANKLIN ST.
SOUTH COLUMBIA ST.
OLD FAYETTEVILLE RD.
SMITH LEVEL RD.
OLD GREENSBORO RD.
JONES FERRY RD.
BATEN RD.
LAUREL HILL PARKWAY
BARBEE CHAPEL RD.
GARRETT RD.
MT. CARMEL CH. RD.
POTTHRESS RD.
LITTLE RD.

DURHAM CBD INSET

MAP COLOR INFORMATION

THE CURRENT ADOPTED THOROUGHFARE PLANS FOR BOTH THE CITY OF DURHAM (ADOPTED IN 1990, REVISED IN 1992) AND CARRBORO AND CHAPEL HILL AND CARRBORO (ADOPTED IN 1985) ARE ILLUSTRATED IN BLACK. INTERCHANGES AND GRADE SEPARATIONS ARE NOT SPECIFIED BY DESIGNATION ON THE CURRENT CHAPEL HILL/CARRBORO PLAN.

THOROUGHFARES AND CBD ARTERIAL AREAS (CHAPEL HILL/CARRBORO) ADOPTED AFTER 1985 PLAN ADOPTION ARE SHOWN IN RED.

PRELIMINARY RECOMMENDATIONS FOR THE DURHAM AREA THOROUGHFARE PLAN (COMBINING THE DURHAM AND CHAPEL HILL/CARRBORO PLANS AND UPDATED PLANNED AND PROPOSED PLAN AND COVERAGE) ARE SHOWN IN BLUE.

EXTENSIONS OF THOROUGHFARE DESIGNATIONS INTO RADIAL OUTSIDE THE DRAFT DRAFT PLANNING BOUNDARY ARE ILLUSTRATED FOR INFORMATION PURPOSES ONLY.

DURHAM-CHAPEL HILL-CARRBORO URBAN AREA

MARCH 1, 1989

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

SCALE

THOROUGHFARE PLAN LEVELS

TYPE OF FACILITY	EXISTING	PROPOSED	LONG-RANGE
MAJOR THOROUGHFARE			
EXPRESSWAY			
OTHER MAJOR			
MINOR THOROUGHFARE			
GRADE SEPARATION (INTERCHANGE)	●	◉	◉
OVERPASS	○	○	○

THOROUGHFARE PLAN APPROVALS

ADOPTED BY	ORIGINAL	CHAPEL HILL & CARRBORO AREA	DURHAM URBAN AREA
DURHAM CITY	05-11-45	---	(PENDING)
CHAPEL HILL	---	04-29-85	
CARRBORO	---	01-11-86	
DURHAM CO.	---	---	
ORANGE CO.	---	---	
DCHC TAC	04-25-45	---	
T.C. DOT	08-14-85	09-19-85	

APPENDIX D

RECOMMENDED DEFINITIONS AND DESIGN STANDARDS
FOR SUBDIVISION ORDINANCES

DEFINITIONS:

I. Streets and Roads:

A. Rural Roads

1. Principal Arterial - A rural link in a network of continuous routes serving corridor movements having trip length and travel density attributes indicative of substantial statewide or interstate travel and existing solely to serve traffic. This network would consist of interstate routes and other routes designated as principal arterials.

2. Minor Arterial - A rural link in a network joining cities and larger towns and providing intrastate and intercounty service at relatively high overall travel speeds with minimum interference to through movement.

3. Major Collector - A road which serves major intracounty travel corridors and traffic generators and provides access to the Arterial system.

4. Minor Collector - A road which provides service to small local communities and links the locally important traffic generators with their rural hinterland.

5. Local Road - A local road that serves primarily to provide access to adjacent land and for travel over relatively short distances.

B. Urban Streets

1. Major Thoroughfares - Major thoroughfares consist of interstate, other freeway, expressway, or parkway links, and major streets that provide for the expeditious movement of high volumes of traffic within and through urban areas.

2. Minor Thoroughfares - Minor thoroughfares are important streets in the city system and perform the function of collecting traffic from the local

access streets and carrying it to the major thoroughfare system. Minor thoroughfares may be used to supplement the major thoroughfare system by facilitating a minor through traffic movement and may also serve abutting property.

3. Local Streets - A local street is any link not on a higher-order urban system and serves primarily to provide direct access to abutting land and access to higher systems.

C. Specific Type Rural or Urban Streets

1. Freeway, expressway, or parkway - Divided multi-lane roadways designed to carry large volumes of traffic at relatively high speeds. A freeway is a divided highway providing for continuous flow of vehicles with no direct access to abutting property or streets and with access to selected crossroads provided via connecting ramps. An expressway is a divided highway with full or partial control of access and generally with grade separations at major intersections. A parkway is a highway for noncommercial traffic, with full or partial control of access, and usually located within a park or a ribbon of parklike development.

2. Residential Collector Street - A local access street which serves as a connector street between local residential streets and the thoroughfare system. Residential collector streets typically collect traffic from 100 to 400 dwelling units.

3. Local Residential Street - Cul-de-sacs, loop streets less than 2,500 feet in length, or streets less than one mile in length that do not connect thoroughfares, or serve major traffic generators, and do not collect traffic from more than 100 dwelling units.

4. Cul-de-sac - A short street having but one end open to traffic and the other end being permanently terminated and a vehicular turn around provided.

5. Frontage Road - A local street or road that is parallel to a full or partial access controlled facility and functions to provide access to adjacent land.

6. Alley - A strip of land, owned publicly or privately, set aside primarily for vehicular service access to the back side of properties otherwise abutting on a street.

II. Property

A. Building Setback Line - A line parallel to the street in front of which no structure shall be erected.

B. Easement - A grant by the property owner for use by the public, a corporation, or person(s), of a strip of land for a specific purpose.

C. Lot - A portion of a subdivision, or any other parcel of land, intended as a unit for transfer of ownership or for development or both. The word "lot" includes the words "plat" and "parcel".

1. Corner Lot - A lot abutting upon two streets at their intersection.

2. Double-Frontage Lot - A continuous (through) lot which is accessible from both of the parallel streets upon which it fronts.

3. Reverse-Frontage Lot - A continuous (through) lot which is accessible from only one of the parallel streets upon which it fronts.

III. Subdivision

A. Subdivider - Any person, firm, corporation or official agent thereof, who subdivides or develops any land deemed to be a subdivision.

B. Subdivision - All divisions of a tract or parcel of land into two or more lots, building sites, or other divisions for the purpose, whether immediate or future, of sale or building development, and all divisions of land involving the dedication of a new street or a change in existing streets; provided, however, that the following shall not be included within this definition nor subject to these regulations: (1) the combination or recombination of portions of previously platted lots where the total number of lots is not increased and the resultant lots are equal to or exceed the standards contained herein; (2) the division of land into parcels greater than five acres where no street right-of-way dedication is involved; (3) the public acquisition by purchase of strips of land for the widening or opening of streets; (4) the division of a tract in single ownership whose entire area is no greater than two acres into not more than three lots, where no street right-of-way dedication is involved and

where the resultant lots are equal to or exceed the standards contained herein.

C. Dedication - A gift, by the owner, of his property to another party without any consideration being given for the transfer. Since a transfer of property is involved, the dedication is made by written instrument and is completed with an acceptance.

D. Reservation - A reservation of land does not involve any transfer of property rights. It simply constitutes an obligation to keep property free from development for a stated period of time.

Design Standards

I. Streets and Roads:

The design of all streets and roads within Orange County shall be in accordance with the accepted policies of the North Carolina Department of Transportation, Division of Highways, as taken or modified from the American Association of State Highway and Transportation Officials (AASHTO) manuals.

The provision of street rights-of-way shall conform and meet the requirements of the thoroughfare plan for Orange County as adopted by the local bodies and the North Carolina Department of Transportation.

The proposed street layout shall be coordinated with the existing street system of the surrounding area. Normally the proposed streets should be the extension of existing streets if possible.

The urban planning area shall consist of that area within the urban planning boundary as depicted on the mutually adopted Orange County Thoroughfare Plan. The rural planning area shall be that area outside the urban planning boundary.

A. Right-of-way Widths: Right-of-way widths shall not be less than the following and shall apply except in those cases where right-of-way requirements have been specifically set out in the Thoroughfare Plan.

		Min. Right-of-way, Ft.
1.	Rural	
a.	Principal Arterial	
	Freeways	350
	Other	200
b.	Minor Arterial	100
c.	Major Collector	100
d.	Minor Collector	100
e.	Local Road	*60

		Min. Right-of-way, Ft.
2.	Urban	
a.	Major Thoroughfare Other than Freeway and Expressway	90
b.	Minor Thoroughfare	70
c.	Local Street	*60
d.	Cul-de-sac	**Variable

The subdivider will only be required to dedicate a maximum of 100 feet of right-of-way. In cases where over 100 feet of right-of-way is desired, the subdivider will be required only to reserve the amount in excess of 100 feet. In all cases in which right-of-way is sought for an access controlled facility, the subdivider will only be required to make a reservation.

A partial width right-of-way, not less than sixty (60) feet in width, may be dedicated when adjoining undeveloped property that is owned or controlled by the subdivider; provided that the width of a partial dedication be such as to permit the installation of such facilities as may be necessary to serve abutting lots. When the said adjoining property is subdivided, the remainder of the full required right-of-way shall be dedicated.

---

*The desirable minimum right-of-way is established as 60 feet. If curb and gutter is provided, 50 feet of right-of-way if adequate.

**The right-of-way dimension will depend on radius used for vehicular turn-around. Distance from edge of pavement of turn around to right-of-way should not be less than the distance from edge of pavement to right-of-way on street approaching turn-around.

B. Street Widths: Widths for street and road classifications other than local shall be as required by the Thoroughfare Plan. Width of local roads and streets shall be as follows:

1. Local Residential
   Curb and gutter section - 26 feet, to face of curb
   Shoulder section - 20 feet to edge of pavement , 4 foot shoulders
2. Residential Collector
   Curb and gutter section - 34 feet, face to face of curb
   Shoulder section - 20 feet to edge of pavement, 6 foot shoulders

C. Geometric Characteristics: The standards outlined below shall apply to all subdivision streets proposed for addition to the State Highway System or Municipal Street System. In cases where a subdivision is sought adjacent to a proposed thoroughfare corridor, the requirements of dedication and reservation discussed under Right-of-way shall apply.

1. Design Speed

The design speeds for subdivisions type streets shall be:

	Desirable	Minimum		
Rural		Level	Rolling	Mountainous
Minor Collector Roads	60	50	40	30
Local Roads including Residential Collectors and Local Residential	50	50	40	30
Urban				
Major Thoroughfares other than Freeway or Expressway	60	50	50	50
Minor Thoroughfares	60	50	40	40
Local Streets	40	40	30	20

2. Maximum and Minimum Grades

a. The maximum grades in percent shall be:

Design Speed	Level	Rolling	Mountainous
60	3	4	6
50	4	5	7
40	5	6	8
30		9	10
20			12

b. A minimum grade for curbed streets normally should not be less than 0.5%, a grade of 0.35% may be allowed where there is a high type pavement accurately crowned and in areas where special drainage conditions may control.

c. Grades for 100 feet each way from intersections should not exceed 5%

d. For streets and roads with projected annual average daily traffic less than 250, short grades less than 500 feet long may be 150% greater.

3. Minimum Sight Distances

In the interest of public safety, no less than the minimum sight distance applicable shall be provided in every instance. Vertical curves that connect each change in grade shall be provided and calculated using the following parameters. (General practice call for vertical curves to be multiples of 50 feet. Calculated lengths shall be rounded up in each case):

Design Speed, MPH	20	30	40	50	60
Stopping Sight Distance -					
Min. Distance, Ft.	150	200	275	350	475
Desirable Distance Ft.	150	200	300	450	650
Min. K* Value For:					
Minimum Crest Curve	16	28	55	85	160
Des. Crest Curve	16	28	65	145	300
Minimum Sag Curve	24	35	55	75	105
Des. Sag Curve	24	35	60	100	155
Passing Sight Distance -					
Minimum Passing Distance, Feet (2 lane)		1100	1500	1800	2100
Minimum K* Value for Crest Vertical Curve		365	686	985	1340

Sight distance provided for stopped vehicles at intersections should be in accordance with A Policy On Geometric Design of Highways and Streets (AASHTO).

4. The following table shows the maximum degree of curve and related maximum superelevation for design speeds. The maximum rate of roadway superelevation (e) for rural roads with no curb and gutter is 0.08. The maximum rate of superelevation for urban streets with curb and gutter is 0.06 with 0.04 desirable.

---

* K is a coefficient by which the algebraic difference in grade may be multiplied to determine the length in feet of the vertical curve which will provide minimum sight distance.

Design Speed MPH	Max. e*	Minimum Radius Feet	Maximum Degree of Curve Degrees
20	.04	125	45.0
30	.04	300	19.0
40	.04	560	10.0
50	.04	925	6.0
60	.04	1410	4.0
20	.06	115	50.0
30	.06	275	21.0
40	.06	510	11.5
50	.06	830	7.0
60	.06	1260	4.5
20	.08	110	53.5
30	.08	250	23.0
40	.08	460	12.5
50	.08	760	7.5
60	.08	1140	5.0

* e = rate of roadway superelevation, foot per foot

D. Intersections

1. Streets shall be laid out so as to intersect as nearly as possible to right angles, and no street should intersect any other at an angle of less than sixty degrees.

2. Property lines at intersections should be set so that the distance from the edge of pavement, of the street turnout, to the property line will be at least as great as the distance from the edge of

pavement to the property line along the intersecting streets. This property line can be established as a radius or as a sight triangle. Greater offsets from the edge of pavement to the property lines will be required, if necessary, to provide sight distance for the stopped vehicle on the side street.

3. Off-set intersections are to be avoided unless exception is granted by the Division of Highways for intersections involving the State Highway System, or the Planning Board for intersections involving only the municipal street system. Intersections which cannot be aligned should be separated by a minimum length of 200 feet between surveyed centerlines.

E. Cul-de-sacs

Cul-de-sacs, unless exception is granted by the local planning board, shall not be more than five hundred feed in length. The distance from the edge of pavement on the vehicular turn-around to the right-of-way line should not be less than the distance from the edge of pavement to right-of-way line on the street approaching the turn-around. Cul-de-sacs should not be used to avoid connection with an existing street or to avoid the extension of an important street.

F Alleys

1. Alleys should be required to serve lots used for commercial and industrial purposes except that this requirement may be waived where other definite and assured provision is made for service access.

Alleys shall not be provided in residential subdivisions unless necessitated by unusual circumstances.

2. The width of an alley shall be at least twenty feet.

3. Dead-end alleys shall be avoided where possible, but if unavoidable, shall be provided with adequate turn-around facilities at the dead-end as may be approved by the Planning Board.

4. Sharp changes in alignment and grade shall be avoided.

G. Permits For Connection To State Roads

An approved permit is required for connection to any existing state system road. This permit is required prior to any construction on the street or road. The application is available at the office of the nearest District Engineer of the Division of Highways.

H. Offsets To Utility Poles

Poles for overhead utilities should be located clear of roadway shoulders, preferably a minimum of thirty feet from the edge of pavement. On streets with curb and gutter, utility poles should be set back a minimum distance of six feet from the face of curb.

I Wheel Chair Ramps

In accordance with Chapter 136, Article 2A, ss136-44.14, all street curbs in North Carolina being constructed or reconstructed for maintenance purposes, traffic operations, repairs, correction of utilities, or altered for any reason after September 1, 1973, shall provide wheelchair ramps for the physically handicapped at all intersections where both curb and gutter and sidewalks are provided and at other major points of pedestrian flow.

Wheelchair ramps and depressed curbs shall be constructed in accordance with details contained in the Department of Transportation, Division of Highways, Publication entitled, "Guidelines, Curb Cuts and Ramps for Handicapped Persons".

J. Horizontal Width on Bridge Decks

1. The clear roadway widths for new and reconstructed bridges serving 2 lane, 2 way traffic should be as follows:

a. Shoulder Section Approach

i. Under 800 ADT During Design Year

Minimum 28 feet width face to face of parapets of rails or pavement width plus 10 feet, whichever is greater.

ii. 800-2000 ADT Design Year

Minimum 34 feet width face to face of parapets or tails or pavement width plus 12 feet, whichever is greater.

iii. Over 2000 ADT Design Year

Minimum 40 feet. Desirable 44 feet width face to face of parapets or rails

b. Curbs and Gutter Approach

i. Under 800 ADT Design Year

Minimum 24 feet face to face of curbs.

ii. Over 800 ADT Design Year

Width of approach pavement measured face to face of curbs. Where curb and gutter sections are used on roadway approaches, curbs on bridges shall match the curbs on approaches in height, in width of face to face of curbs, and in crown drop. The distance from face of curb to face of parapet or rail shall be 1'6" minimum, or greater if sidewalks are required.

2. The clear roadway widths for new and reconstructed bridges having four or more lanes undivided two-way traffic should be as follows:

a. Shoulder Section Approach - Width of approach pavement plus width of usable shoulders on the approach left and right.
Minimum 8'
Desirable 10'

b. Curb and Gutter Approach - Width of approach pavement measured face to face of curbs.

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